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**State &
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Forest Pest Management

A Demonstration for Hazard Rating Susceptibility of Stands to Douglas-fir Tussock Moth Defoliation on the Palouse Ranger District

I. Probability of Defoliation

Report No. 81-8
April 1981

by Bruce L. Kessler, Robert C. Heller and
John S. Hard

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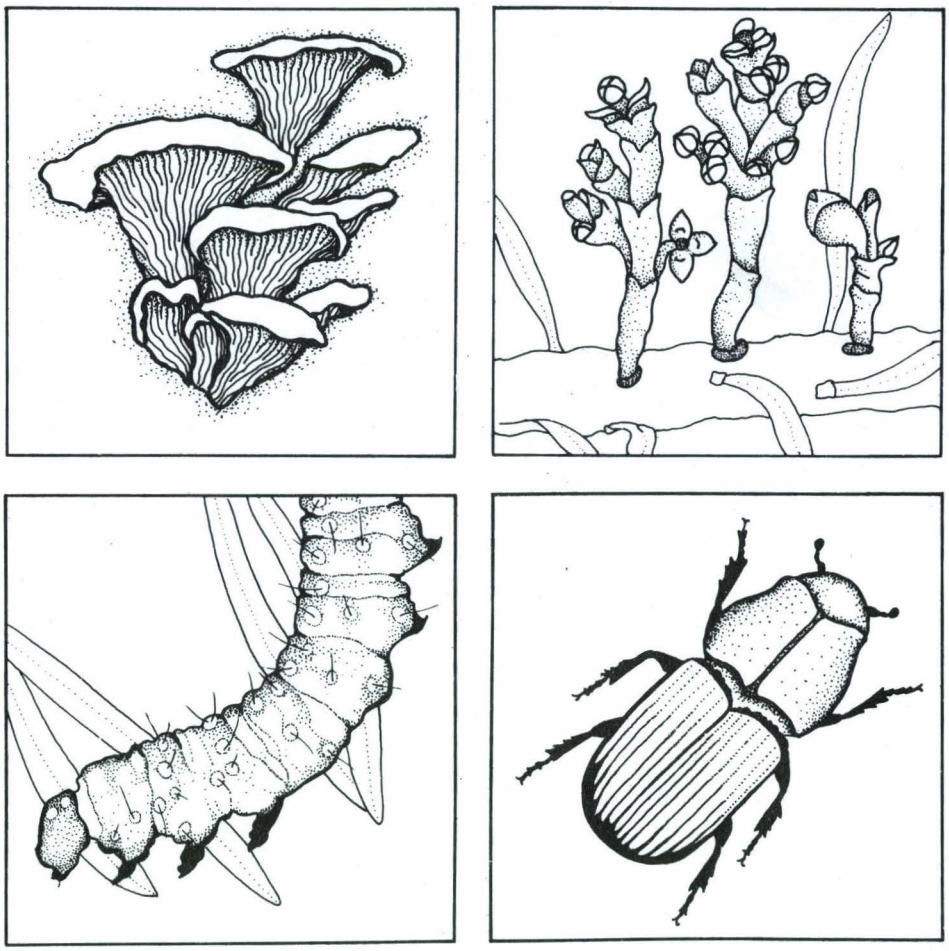

ACKNOWLEDGMENTS

We thank Dr. Joseph Ulliman, Hal Anderson, and William Befort of the Forestry Remote Sensing Unit, University of Idaho, for technical advice on aerial photointerpretation. We also thank Dr. Peter Mika for assistance in computer programing.

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3450
November 1980

A DEMONSTRATION FOR HAZARD RATING SUSCEPTIBILITY OF STANDS TO DOUGLAS-FIR TUSSOCK MOTH DEFOLIATION ON THE PALOUSE RANGER DISTRICT

I. Probability of Defoliation

by

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ABSTRACT

A practical demonstration of a method for rating forest stands as to their probability of defoliation by the Douglas-fir tussock moth using aerial photographs and available cruise data was done in the Palouse Ranger District, Clearwater National Forest, Idaho.

A nonlinear computer program, RISK, was used to identify significant independent variables for the prediction of probability of defoliation (dependent variable). A hazard rating model developed in the Blue Mountains of Oregon and Washington was localized for the Palouse District using data collected from previously established plots. Data for the Palouse RD hazard rating were obtained from Stand Examination and Management Status Records, aerial photos, topographic maps, and Orthophoto Quadrangles.

Four final hazard rating models were developed using various combinations of the following independent variables: elevation, slope, cosine of the aspect times the tangent of the slope, sine of the aspect times the tangent of the slope, topographic position, stand level, stand density, presence of volcanic ash in the soil, stand age, and percent host species.

Hazard ratings which indicate the probabilities of a stand being defoliated during a tussock moth outbreak were computed for 496 forest stands, and stands were color-coded on a map by probability of defoliation classes.

INTRODUCTION

In 1976, Miller showed that a remote-sensing approach to identifying preferred Douglas-fir tussock moth (DFTM) sites was feasible. He used a nonlinear computer program, RISK, developed by Walker and Duncan (1967) and adapted by Hamilton (1974), to identify independent variables which correlated with defoliation by the tussock moth. The independent variables that Miller (1976) found using aerial photos were similar to those that Stoszek et al. (in review) found using data collected on the ground.

OBJECTIVE

The objective of this pilot project was to implement, on a portion of the Palouse Ranger District, Clearwater National Forest, Idaho, the techniques described by Heller and Sader (1980), in a Douglas-fir tussock moth manual on the risk-rating system.

MATERIALS

Photos, Maps, and Stand Data:

1. Current aerial photos - 1:24,000 or larger. Black and white or color 9- by 9-inch, full stereo coverage.

2. Orthophoto Quads - 1:24,000. Prints available from Western Mapping Center, Menlo Park, CA, or from USDA-Forest Service, Regional Office, Missoula, MT, can be either photographic prints or diazo prints; can have topographic lines, but interval should be large enough so that lines do not interfere with ground cover interpretation. Section line grid assists in transferring stands from maps.

3. Topographic maps - 1:24,000; needed to find elevation and keep a record of stand locations; not needed if Orthophoto Quads have topographic lines and the record of stands is kept on the Orthophoto Quads.

4. Forest Service Stand Examination and Management Status Records for age of stand and host species purity.

5. Soils maps showing the distribution of volcanic ash.

Templates and Guides

Five transparent overlays and one comparator, described in the 1980 DFTM manual by Heller and Sader were used to locate plots and to determine density, aspect, slope, and topographic position. Figures in appendix A show construction.

Other Equipment and Materials:

1. A copy of the RISK, Model Evaluation, and Hazard Rating computer programs (appendix B).

2. Clear Mylar acetate for overlays on Orthophoto Quads and aerial photos.

3. Assorted colored marking pens and soft eraser for use on overlays.

4. Mirror stereoscope.

METHODS

The most important and most difficult step was to localize the model developed in the Blue Mountains to the Palouse Ranger District. We did this by executing the RISK program, developed by Walker and Duncan (1967) and adapted by Hamilton (1974), and Model Evaluation program, supplied by Hamilton, on test plot data from ground study plots by Stoszek et al. (in review) to determine which independent variables were highly correlated with defoliation by the DFTM. Prescribed guidelines (Miller, 1976) were followed and new prediction models were developed that required data not used in the original model. The presence of volcanic ash was added to the model, but tree crown diameter was deleted due to measurement inaccuracies on 1:24,000 aerial photos.

With significant independent variables identified, the data were assembled from existing reports, maps, and photos. Stand and compartment boundaries, recorded on 1:24,000 topographic maps at District headquarters, were traced on Mylar overlays, which were then placed over the Orthophoto Quads and registered. Transfer of the stand boundaries from the Orthophoto Quads onto aerial photos were then easily accomplished. Stand boundaries recorded on the Ranger District maps were not always accurate, and some interpolation and reestablishment of boundaries was required. If a stand contained large variation in aspect, topographic position, crown level, density, or other significant variables, it was subdivided into 10-acre minimum-sized numbered substands.

Slope, crown level, aspect, stand density, and topographic position data for each stand were taken from the photos. Elevation and ash presence were taken from topographic and volcanic ash distribution maps. Ranger District compartment records provided percent of host species and stand age on some of the stands.

Radiation index was calculated using aspect and slope (Stage, 1975).

Interpretation of the aerial photos proceeded quickly, and all data were recorded on IBM FORTRAN coding forms. Procedures for interpretation of the independent variables are as follows:

Stand Density - A 10 percent random plot sampling grid (fig. 1, appendix A) was used. The grid was tossed on the photo until at least one plot fell in the stand being interpreted, and the plot center was then pinpricked lightly on the photo. A 2-acre plot circle on clear acetate with radius = .083" at 1:24,000 scale, was centered on the pinprick, and visual "cramming" or direct estimation of trees was compared with a plot density scale (fig. 2, appendix A) to estimate the density of the plot. If more than one photo plot fell within the stand, plot densities were averaged and the average value was recorded on the data form.

We found it necessary to base estimates of aspect and slope of the entire stand or substand by subjective determination of average stand attributes. This differs from the instructions given by Heller and Sader (1980) where measurements were taken on individual plots.

Aspect - A transparent overlay divided into 16 equal divisions (fig. 3, appendix A) was placed on the photo and oriented to true north. Downhill slope direction within the stand being examined was then recorded as a value between 1 and 16.

Slope - Stand slopes were divided using slope comparator stereotemplates into three numerical classes:

Class	Percent	Midpoint Value (Percent)
1	0-15	8
2	15-65	40
3	65+	80

The slope comparator stereotemplate (fig. 4, appendix A) for the 15 percent or 65 percent slope was placed over the photos. If the general slope of the stand appeared less than the 15 percent slope comparator, it was recorded as 1. If it appeared greater than the 15 percent and less than the 65 percent comparator, it was recorded as 2. If it appeared greater than the 65 percent comparator, it was recorded as 3. Use of slope comparator templates to determine percent slope classes eliminated time consuming parallax measurements required to compute actual percent slope.

Topographic position - Topographic position was divided into three classes (fig. 5, appendix A). Many stands included all three classes, but the class that dominated by area or had the most timber was the class recorded. Class values were recorded as follows:

1 - Ridgetop
2 - Sidehill
3 - Valley or bottom

Stand crown level - Crown level was recorded in two classes:

1 - Even-aged or single stand level
2 - Uneven-aged or multistoried stand

Elevation - Elevation was taken from topographic maps, and an average value was recorded for each stand.

Stand age and host purity - Age and host purity (percent host species) were taken directly from Stand Examination and Management Status Records. Tussock moth host species for the Palouse Ranger District are Douglas-fir, grand fir, and subalpine fir.

Host purity was computed as a percentage for each stand, but it was computed in two separate ways depending on whether species were recorded as trees per acre or as basal area per acre in Stand Examination Records (see models II and III, appendix C, and codes 2, 3, 4, and 5, appendix D).

Volcanic ash - Recent soils maps were examined and ash presence was recorded as follows:

0 - ash absent
1 - ash present

About 8 percent of photo plots were ground checked to insure accuracy of photointerpretation. Most ground checks were done in the early stages of photointerpretation to confirm accuracy of the slope comparator templates.

After stand data were punched on data cards, probability of defoliation was calculated by computer using appropriate models (appendix C). Results of the calculations for each stand are shown in appendix D.

On the Palouse Ranger District 496 stands and substands were hazard rated for probability of defoliation by the Douglas-fir tussock moth. Each stand received a numerical hazard rating (computer printout, appendix D) except those stands that received a "0" percent rating. Rating for those stands is blank on the computer printout because those stands were either recently clearcut or were composed of nonhost species, automatically resulting in a zero-hazard classification without implementing the RISK models. 4/

Probability of defoliation was divided into five percentage classes and associated color codes:

4/ The terms RISK and hazard rating may be confusing to the reader. RISK refers to the models used; hazard rating is the probability that a stand will be defoliated.

Percentage Class	Color Code
0-20	Blue
20.1-40	Green
40.1-60	Yellow
60.1-80	Orange
80.1-100	Red

Examined stand locations, numerical codes, and hazard class by color code are shown on topographic quadrangle maps for portions of Latah County, Idaho, included in the project (appendix F).

LITERATURE CITED

Hamilton, David A., Jr. 1974. Event of probabilities estimated by regression. U.S. Forest Serv. Res. Pap. INT-152. 18 pp.

Heller, Robert C., Steven A. Sader, and Wayne A. Miller. 1977. Identification of preferred Douglas-fir tussock moth sites by photo interpretation of stand, site, and defoliation conditions. DFTM final report. 23 pp.

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Miller, Wayne A. 1976. Remote sensing approach to identifying preferred Douglas-fir tussock moth sites. Masters thesis, University of Idaho. 48 pp.

Stage, A. R. 1975. An expression of aspect, slope, and habitat on tree growth. Forest Science, Vol. 22, No. 3.

Stoszek, K. J., P. G. Mika, J. A. Moore, and H. L. Osborne. (In review.) Relationships of Douglas-fir tussock moth, Orgyia pseudotsugata, defoliation to site and stand characteristics in northern Idaho. For. Sci.

Walker, S. H., and D. B. Duncan. 1967. Estimation of the probability of an event as a function of several independent variables. Biometrika 54:167-179.

APPENDIX A

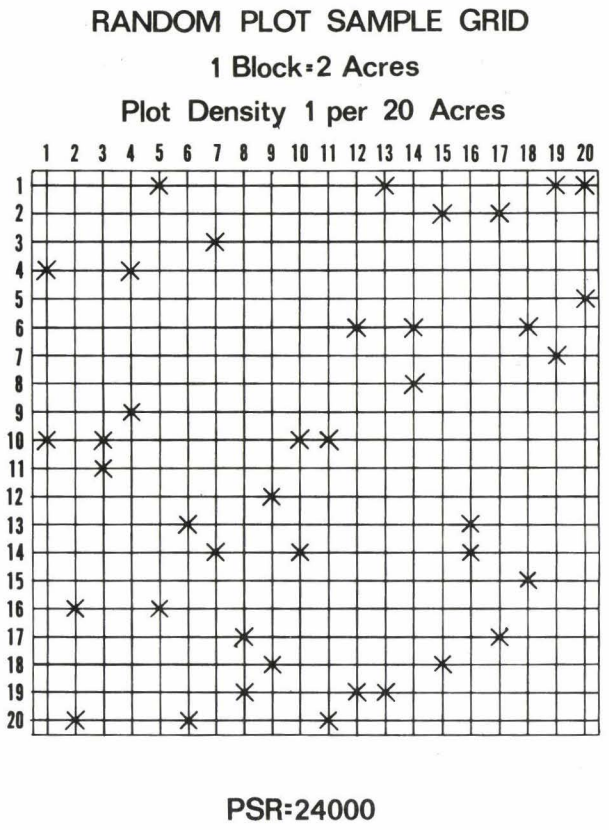

Figure 1.--Random plot sample grid. Insures random plot selection and 10 percent sample coverage.

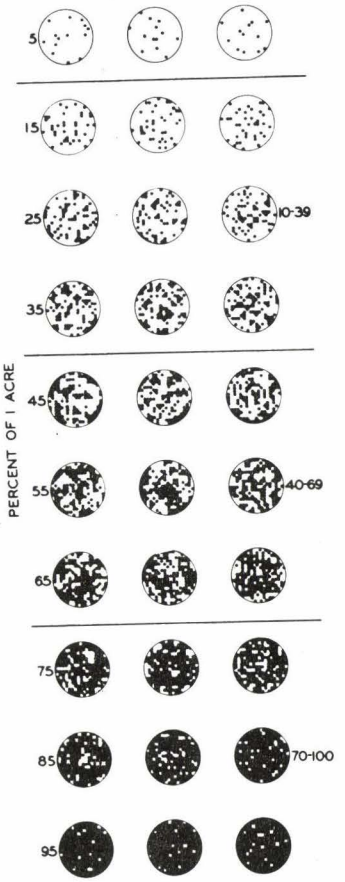

Figure 2.--Plot density comparator scale. To help estimate stand density.

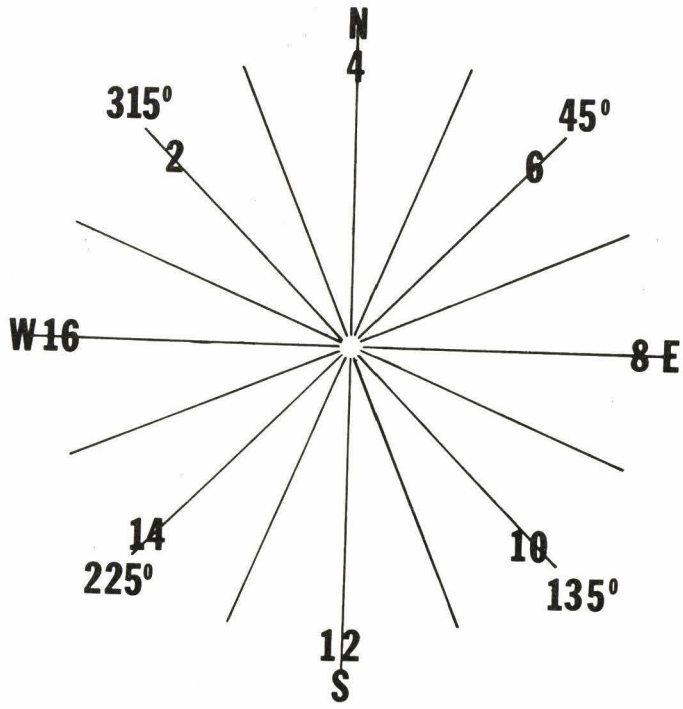

Figure 3.--Asepct transparency. To estimate stand aspect.

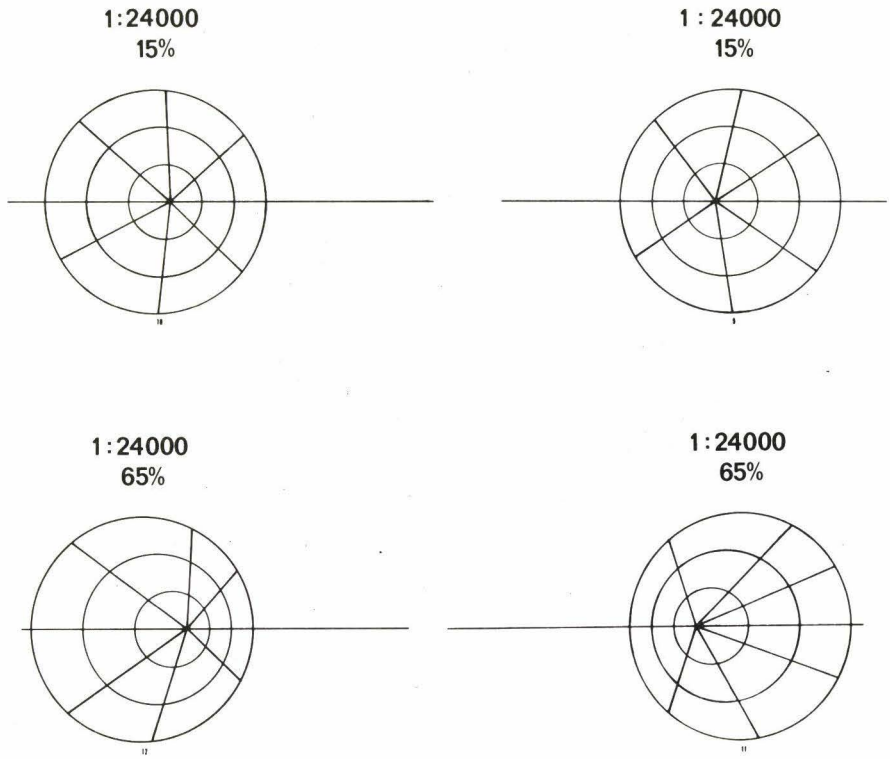

Figure 4.--Slope comparators. Eliminates use of parallax bar to compute slope by grouping slope into three classes.

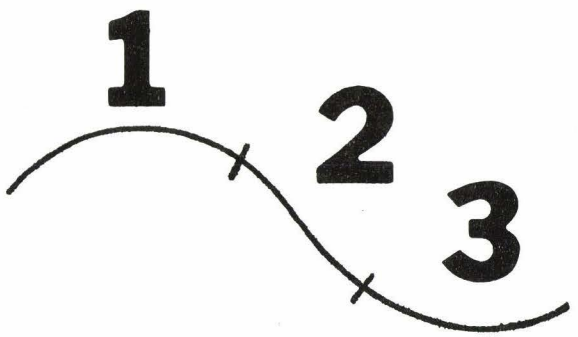

Figure 5.--Topographic position. To determine location of the stand on ridge, sidehill, or bottom.

APPENDIX B

PART 1. MODEL EVALUATION PROGRAM

PART 2. RISK PROGRAM

```
0001            DIMENSION PM(21,3),AK1(21),X(15),B(15),D(15)
0002            DIMENSION F1000(20),HEAD(20),TVL(21),SP(19),SOB(19)
0003         3000 READ(5,1000,END=3001) F1000
0004         1000 FORMAT(20A4)
0005            READ(5,20) NR1,NR,NC
0006           20 FORMAT (6I5)
0007            WSUM=0.0
0008            READ(5,21)(B(I),I=1,NR)
0009           21 FORMAT(8F10.0)
0010            WRITE(6,1500) F1000
0011         1500 FORMAT(1H0,20A4)
0012            WRITE(6,1501) NR1,NR,NC
0013         1501 FORMAT(1H0,3I5)
0014            WRITE(6,1502) (B(I),I=1,NR)
0015         1502 FORMAT(1H0,8F10.7)
0016            II=0
0017            PM(1,2)=0.0
0018            PM(1,3)=5.0
0019            PM(2,2)=5.0
0020            PM(2,3)=10.0
0021            DO 200 I=3,21
0022            PM(I,2)=PM(I-1,3)
0023         200  PM(I,3)=PM(I,2)+10.0
0024            CHISUM=0.0
0025            DO 347 ITI=1,21
0026            TVL(ITI)=0.0
0027            PM(ITI,1) =0.0
0028         347 AK1(ITI)=0.0
0029            DO 375 K=1,NC
0030            READ(5,F1000)(D(IJ),IJ=1, 10)
0031            WT=1.
0032            X(2)=D(1)
0033            X(3)=D(3)
0034            IF(X(3).LE.15)X(3)=8
0035            IF(X(3).GT.15.AND.X(3).LE.65)X(3)=40
0036            IF(X(3).GT.65)X(3)=80
0037            X(4)=SIN(D(2))*(X(3)/100)
0038            X(5)=COS(D(2))*(X(3)/100)
0039            X(6)=D(4)
0040            X(7)=D(5)
0041            X(8)=D(6)
0042            X(9)=D(8)
0043            IF (X( 9).GT.0.) X( 9)=1.
0044            X(10)=EXP(D(9))
0045            X(11)=D(10)
0046            IF(D(7).LE.10.) GO TO 4
0047            D(7)=1.
0048            GO TO 5
0049          4  D(7)=0.
0050          5  X(NR1)=D(7)
0051            II=II+1
0052            WSUM=WSUM+WT
0053            PN=B(1)
0054            DO 371 J=2,NR
0055         371 PN=PN+B(J)*X(J)
0056            AK=1.0/(1.0+EXP(-PN))
0057            WRITE(6,50) AK
0058           50 FORMAT(F10.8)
```

APPENDIX B-1

MODEL EVALUATION PROGRAM

```
0059              J=D(10)/.1+2
0060              IF(D(10).LT.0.05)J=1
0061          373 PM(J,1) =PM(J,1) +X(NR1)*WT
0062              TVL(J)=TVL(J)+WT
0063              AK1(J)=AK1(J)+AK*WT
0064          375 CONTINUE
0065              ANC=II
0066              CON1=100.0/ANC
0067              DO 663 I=1,21
0068              TVL(I)=TVL(I)*II/WSUM
0069              CON=TVL(I)
0070              CINTVL=CON*CON1
0071              IF(CON)660,662,660
0072          660 YCON=AK1(I)*II/WSUM
0073              PM(I,1)=PM(I,1)*II/WSUM
0074              CHI2=ANC*(PM(I,1) -YCON)*(PM(I,1) -YCON)/(YCON*(ANC-YCON))
0075              CHISUM=CHISUM+CHI2
0076              WRITE(6,2140)I,PM(I,2) ,PM(I,3) ,CINTVL,TVL(I),PM(I,1) ,YCON,CHI2
0077              GO TO 663
0078          662 WRITE(6,2140)I,PM(I,2) ,PM(I,3) ,CINTVL,TVL(I),PM(I,1)
0079         2140 FORMAT(I15,F11.3,5H  -  ,F7.3,F10.2,F15.1,F13.1,F15.1,F15.2)
0080          663 CONTINUE
0081              WRITE(6,2155) ANC,CHISUM
0082              REWIND 8
0083              GO TO 3000
0084         3001 CALL EXIT
0085         2155 FORMAT(50X,'N=',F8.2,28X,E15.8)
0086              STOP
0087              END
```

SUBPROGRAMS CALLED

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
IBCOM#	100	EXIT	104	SIN	108	COS	10C	EXP	110

SCALAR MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
NR1	124	NR	128	NC	12C	WSUM	130	I	134
II	138	CHISUM	13C	ITI	140	K	144	IJ	148
WT	14C	PN	150	J	154	AK	158	ANC	15C
CON1	160	CON	164	CINTVL	168	YCON	16C	CHI2	170

ARRAY MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
PM	174	AK1	270	X	2C4	B	300	D	33C
F1000	378	HEAD	3C8	TVL	418	SP	46C	SOB	488

FORMAT STATEMENT MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
1000	504	20	50A	21	510	1500	517	1501	520
1502	529	50	533	2140	538	2155	558		

OPTIONS IN EFFECT NOID,EBCDIC,SOURCE,NOLIST,NODECK,LOAD,MAP
OPTIONS IN EFFECT NAME = MAIN , LINECNT = 60
STATISTICS SOURCE STATEMENTS = 87,PROGRAM SIZE = 3254
12 *STATISTICS* NO DIAGNOSTICS GENERATED

```
(6X,F4.0,7X,F3.0,6X,F2.0,5X,F1.0,9X,F1.0,4X,F2.0,T68,F2.0/9X,F5.1,F6.3,T44,F5.3)
   12   11   70
-3.9548597 0.0005938-0.0138702 1.4121895-0.3011780 0.0342283-0.3538030 0.0072671
-1.0819292 0.0351754 2.4390192
.34507167
.84742862
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.06346375

1	0.0	-	5.000	12.86	9.0	1.0	2.5	0.95
2	5.000	-	10.000	8.57	6.0	2.0	1.0	1.03
3	10.000	-	20.000	5.71	4.0	0.0	1.5	1.57
4	20.000	-	30.000	7.14	5.0	4.0	2.2	1.48
5	30.000	-	40.000	17.14	12.0	5.0	5.5	0.05
6	40.000	-	50.000	8.57	6.0	4.0	3.0	0.35
7	50.000	-	60.000	10.00	7.0	5.0	4.0	0.26
8	60.000	-	70.000	5.71	4.0	2.0	2.5	0.12
9	70.000	-	80.000	4.29	3.0	2.0	2.3	0.05
10	80.000	-	90.000	11.43	8.0	6.0	5.4	0.08
11	90.000	-	100.000	4.29	3.0	2.0	1.7	0.06
12	100.000	-	110.000	4.29	3.0	1.0	2.2	0.70
13	110.000	-	120.000	0.0	0.0	0.0		
14	120.000	-	130.000	0.0	0.0	0.0		

15	130.000	-	140.000	0.0		0.0	0.0
16	140.000	-	150.000	0.0		0.0	0.0
17	150.000	-	160.000	0.0		0.0	0.0
18	160.000	-	170.000	0.0		0.0	0.0
19	170.000	-	180.000	0.0		0.0	0.0
20	180.000	-	190.000	0.0		0.0	0.0
21	190.000	-	200.000	0.0		0.0	0.0

N= 70.00

0.66900702E 01

```
FORTRAN IV G LEVEL  21                TRNS              DATE = 80154        20/57/48          PAGE 0001

0001                SUBROUTINE TRNS(D,NR1,NR,X,R)
0002                DIMENSION D(32),X(32)
0003                X(2)=D(1)
0004                IF(D(3).LE.15)D(3)=8
0005                IF(D(3).GT.15.AND.D(3).LE.65)D(3)=40
0006                IF(D(3).GT.65)D(3)=80
0007                X(3)=D(3)
0008                X(4)=SIN(D(2))*(X(3)/100)
0009                X(5)=COS(D(2))*(X(3)/100)
0010                X(6)=D(4)
0011                X(7)=D(5)
0012                X(8)=D(6)
0013                X(9)=D(8)
0014                IF (X( 9).GT.0.) X( 9)=1.
0015                X(10)=EXP(D(9))
0016                X(11)=D(10)
0017                IF(D(7).LE.10.)GO TO 4
0018                D(7)=1.
0019                GO TO 5
0020              4 D(7)=0.
0021              5 X(NR1)=D(7)
0022                R=1
0023                RETURN
0024                END
```

APPENDIX B-2
RISK PROGRAM

SUBPROGRAMS CALLED

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
SIN	B4	COS	B8	EXP	BC				

SCALAR MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
NR1	CC	R	D0	NR	D4				

ARRAY MAP

SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION	SYMBOL	LOCATION
D	D8	X	DC						

```
   *OPTIONS IN EFFECT*  NOID,EBCDIC,SOURCE,NOLIST,NODECK,LOAD,MAP
   *OPTIONS IN EFFECT*  NAME = TRNS    , LINECNT =       60
   *STATISTICS*    SOURCE STATEMENTS =       24,PROGRAM SIZE =      838
   *STATISTICS*  NO DIAGNOSTICS GENERATED
```

SEQUENTIAL REGRESSION ANALYSIS PROGRAM

FACTORS CONRTIBUTING TO DEFOLIATION BY THE DOUGLAS FIR TUSSOCK MOTH--73 DATA

REGRESSOR SET NO. 1 REGRESSOR SET RUN NO. 1

NUMBER OF REGRESSORS	11
NUMBER OF OBSERVATIONS	70
NUMBER OF OBSERVATIONS WITH ONE OR MORE MISSING VALUES	0
INITIAL ESTIMATE OF PROBABILITY	4.85714E-01
MISSING DATA CODE	9.99900E 03
NUMBER OF OBSERVATIONS (WEIGHTED)	70

MEANS (UNWEIGHTED DATA)

1	1.00000E 00	5	6.57346E-03	9	8.42857E-01
2	3.83457E 03	6	1.61429E 00	10	6.18419E 01
3	3.96571E 01	7	1.62857E 00	11	4.33568E-01
4	-3.22629E-02	8	5.35714E 01	12	4.85714E-01

STANDARD DEVIATIONS (UNWEIGHTED DATA)

1	0.0	5	2.83630E-01	9	3.66563E-01
2	3.81868E 02	6	5.72127E-01	10	2.35207E 01
3	7.26298E 00	7	4.86676E-01	11	3.11776E-01
4	2.88577E-01	8	2.70954E 01	12	5.03405E-01

CORRELATION_COEFFICIENTS___(UNWEIGHTED_DATA)

R

	1	2	3	4	5	6
1	C.C					
2	0.0	1.00000E 00				
3	0.0	4.61510E-02	1.00000E 00			
4	0.0	-1.43949E-01	-1.79501E-02	1.00000E 00		
5	0.0	8.04824E-02	2.28136E-01	-2.80654E-03	1.00000E 00	
6	0.0	-1.14520E-01	1.90940E-01	1.21746E-01	5.34993E-03	1.00000E 00

	1	2	3	4	5	6
7	0.0	2.56709E-02	-3.65487E-02	3.20451E-02	9.15139E-02	-1.48677E-03
8	0.0	9.78605E-02	1.59496E-01	-1.80660E-01	5.44096E-02	2.47090E-02
9	C.0	3.60348E-01	-2.05292E-02	-1.54248E-01	-1.49296E-01	-1.67817E-02
10	0.0	9.55491E-02	-1.13088E-01	-1.37457E-01	-2.71109E-02	-3.03962E-01
11	0.0	-7.17668E-02	-2.29960E-02	3.96008E-02	-9.43393E-02	-2.00156E-01
12	0.0	1.76933E-02	-8.06360E-02	1.28137E-01	-4.81340E-02	-1.45209E-01

	7	8	9	10	11	12
7	1.00000E 00					
8	-5.46380E-01	1.00000E 00				
9	-6.96285E-03	9.38041E-02	1.00000E 00			
10	1.49853E-02	4.98180E-02	-9.70218E-02	1.00000E 00		
11	2.63896E-01	-4.50318E-01	1.24193E-01	3.00369E-01	1.00000E 00	
12	-2.19711E-02	-4.95313E-02	-1.30149E-01	4.08067E-01	3.19373E-01	1.00000E 00

T-RATIOS_FOR_CORRELATION_COEFFICIENTS___(UNWEIGHTED_DATA)

T

	1	2	3	4	5	6
1	0.0					
2	0.0	0.0				
3	0.0	3.80977E-01	0.0			
4	0.0	1.19953E 00	1.48044E-01	0.0		
5	0.0	6.65835E-01	1.93221E 00	2.31434E-02	0.0	
6	0.0	9.50606E-01	1.60404E 00	1.01147E 00	4.41173E-02	0.0

	1	2	3	4	5	6
7	0.0	2.11757E-01	3.01590E-01	2.64386E-01	7.57823E-01	1.22603E-02
8	0.0	8.10870E-01	1.33229E 00	1.51468E 00	4.49338E-01	2.03818E-01
9	0.0	3.18551E 00	1.69323E-01	1.28737E 00	1.24508E 00	1.38405E-01
10	0.0	7.91539E-01	9.38568E-01	1.14436E 00	2.23644E-01	2.63102E 00
11	0.0	5.93334E-01	1.89680E-01	3.26813E-01	7.81426E-01	1.68462E 00
12	0.0	1.45926E-01	6.67113E-01	1.06543E 00	3.97384E-01	1.21025E 00

	7	8	9	10	11	12
7	0.0					
8	5.37954E 00	0.0				
9	5.74185E-02	7.76954E-01	0.0			
10	1.23586E-01	4.11320E-01	8.03854E-01	0.0		
11	2.25612E 00	4.15897E 00	1.03211E 00	2.59682E 00	0.0	
12	1.81222E-01	4.07292E-01	1.08245E 00	3.68585E 00	2.77916E 00	0.0

PRODUCT_MOMENTS___(UNWEIGHTED_DATA)

PM

	1	2	3	4	5	6
1	0.0					
2	0.0	1.45824E 05				
3	0.0	1.28000E 02	5.27509E 01			
4	0.0	-1.58629E 01	-3.76222E-02	8.32766E-02		
5	0.0	8.71699E 00	4.69959E-01	-2.29712E-04	8.04458E-02	
6	0.0	-2.50199E 01	7.93422E-01	2.01006E-02	8.68146E-04	3.27329E-01

	1	2	3	4	5	6
7	0.0	4.77083E 00	-1.29189E-01	4.50051E-03	1.26322E-02	-4.13978E-04
8	0.0	1.01255E 03	3.13877E 01	-1.41260E 00	4.18141E-01	3.83039E-01
9	0.0	5.04411E 01	-5.46557E-02	-1.63166E-02	-1.55220E-02	-3.51947E-03
10	0.0	8.58203E 02	-1.93188E 01	-9.32994E-01	-1.80861E-01	-4.09035E 00
11	0.0	-8.54438E 00	-5.20727E-02	3.56294E-03	-8.34233E-03	-3.57029E-02
12	0.0	3.40127E 00	-2.94823E-01	1.86146E-02	-6.87260E-03	-4.18219E-02

	7	8	9	10	11	12
7	2.36853E-01					
8	-7.20494E 00	7.34161E 02				
9	-1.24215E-03	9.31679E-01	1.34369E-01			
10	1.71535E-01	3.17491E 01	-8.36504E-01	5.53222E 02		
11	4.00419E-02	-3.80415E 00	1.41935E-02	2.20266E 00	9.72045E-02	
12	-5.38281E-03	-6.72876E-01	-2.40164E-02	4.83168E 00	5.01254E-02	2.53416E-01

RESUME OF UNCORRECTED REGRESSION COEFFICIENTS FOR THIS 6 PASS RUN FOLLOWING OBSERVATION 70

PASS	1	1	-0.066060	2	0.000482	3	-0.015942	4	1.155471	5	-0.180093
		6	0.013460	7	-0.317223	8	0.005561	9	-0.896251	10	0.027627
		11	1.984075								
		ERROR MEAN SQUARE	=	1.182077							
PASS	2	1	-0.082498	2	0.000577	3	-0.014846	4	1.393804	5	-0.270352
		6	0.034637	7	-0.359545	8	0.006856	9	-1.067441	10	0.034522
		11	2.404896								
		ERROR MEAN SQUARE	=	1.235752							
PASS	3	1	-0.085728	2	0.000594	3	-0.013954	4	1.412763	5	-0.299178
		6	0.035492	7	-0.354664	8	0.007254	9	-1.082956	10	0.035204
		11	2.442036								
		ERROR MEAN SQUARE	=	1.381479							
PASS	4	1	-0.085934	2	0.000594	3	-0.013864	4	1.412264	5	-0.301348
		6	0.034322	7	-0.353778	8	0.007271	9	-1.082047	10	0.035180
		11	2.439351								
		ERROR MEAN SQUARE	=	1.403416							
PASS	5	1	-0.085911	2	0.000594	3	-0.013869	4	1.412188	5	-0.301194
		6	0.034224	7	-0.353797	8	0.007267	9	-1.081924	10	0.035175
		11	2.439013								
		ERROR MEAN SQUARE	=	1.403399							
PASS	6	1	-0.085909	2	0.000594	3	-0.013870	4	1.412188	5	-0.301178
		6	0.034229	7	-0.353803	8	0.007267	9	-1.081927	10	0.035175
		11	2.439019								
		ERROR MEAN SQUARE	=	1.403257							

REGRESSION COEFFICIENTS

1	-3.95487E 00	5	-3.01178E-01	9	-1.08193E 00
2	5.93883E-04	6	3.42292E-02	10	3.51755E-02
3	-1.38702E-02	7	-3.53803E-01	11	2.43902E 00
4	1.41219E 00	8	7.26726E-03		

VARIANCE MATRIX

V

	1	2	3	4	5	6
1	1.42911E 01					
2	-2.18815E-03	6.80260E-07				
3	-4.11018E-02	-3.21376E-06	1.61751E-03			
4	-4.91670E-01	-1.01470E-05	2.65512E-03	1.13194E 00		
5	8.64811E-01	-1.01621E-04	-9.75503E-03	-9.39189E-03	1.06425E 00	
6	-6.61474E-01	7.48795E-05	-4.83220E-03	-5.35552E-02	4.14975E-02	2.82806E-01

	1	2	3	4	5	6
7	-7.62468E-01	-9.13165E-05	-4.15049E-04	9.16603E-02	-9.07090E-02	-2.21960E-02
8	-1.73933E-02	-6.80107E-07	-1.13874E-04	1.76500E-03	-1.99960E-03	4.62953E-04
9	5.92768E-01	-3.14042E-04	3.86624E-03	1.37238E-01	1.24246E-01	-4.16103E-02
10	-1.39858E-02	-1.15195E-06	8.40515E-05	3.73595E-03	8.76792E-05	1.47801E-03
11	-1.21218E 00	2.23745E-04	-9.54388E-03	-5.72103E-02	-1.43054E-02	1.15085E-01

	7	8	9	10	11
7	5.28387E-01				
8	6.29134E-03	2.61483E-04			
9	8.58599E-03	-2.94732E-03	8.42196E-01		
10	-4.35204E-04	-4.20228E-05	2.88084E-03	2.45734E-04	
11	-1.90251E-02	9.51896E-03	-4.58141E-01	-4.32912E-03	1.57506E 00

STUDENT-T TEST

1	-1.0462	5	-0.2919	9	-1.1789
2	0.7201	6	0.0644	10	2.2439
3	-0.3449	7	-0.4867	11	1.9434
4	1.3273	8	0.4494		

ANALYSIS OF VARIANCE

SOURCE	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARE	F RATIO
REGRESSION	10	14.07	1.40690	1.26047
ERROR	59	65.85	1.11617	
TOTAL	69	79.92		

STUDENT-T TEST

(BASED ON ESTIMATED ERROR VARIANCE)

1	-0.9902	5	-0.2763	9	-1.1159
2	0.6816	6	0.0609	10	2.1239
3	-0.3264	7	-0.4607	11	1.8395
4	1.2564	8	0.4254		

DISTRIBUTION OF ESTIMATED PROBABILITIES IN THE SAMPLE

CLASS	INTERVAL	PERCENTAGE	NUMBER IN INTERVAL	NUMBER OF EVENTS	EXPECTED NUMBER OF EVENTS	CHI-SQUARED
1	0.0 - 0.01	0.0	0.0	0.0		
2	0.01 - 0.05	0.0	0.0	0.0		
3	0.05 - 0.10	7.14	5.0	0.0	0.3	0.35
4	0.10 - 0.15	5.71	4.0	0.0	0.5	0.54
5	0.15 - 0.20	4.29	3.0	0.0	0.5	0.51
6	0.20 - 0.25	5.71	4.0	0.0	0.9	0.93
7	0.25 - 0.30	8.57	6.0	4.0	1.6	3.54
8	0.30 - 0.35	4.29	3.0	2.0	1.0	0.96
9	0.35 - 0.40	2.86	2.0	0.0	0.7	0.73
10	0.40 - 0.45	7.14	5.0	2.0	2.1	0.01
11	0.45 - 0.50	4.29	3.0	1.0	1.4	0.14
12	0.50 - 0.55	7.14	5.0	3.0	2.6	0.06
13	0.55 - 0.60	7.14	5.0	4.0	2.9	0.46
14	0.60 - 0.65	7.14	5.0	3.0	3.1	0.01
15	0.65 - 0.70	2.86	2.0	1.0	1.3	0.09
16	0.70 - 0.75	7.14	5.0	3.0	3.6	0.11
17	0.75 - 0.80	2.86	2.0	2.0	1.5	0.15
18	0.80 - 0.85	4.29	3.0	2.0	2.5	0.10
19	0.85 - 0.90	8.57	6.0	5.0	5.2	0.01
20	0.90 - 0.95	1.43	1.0	1.0	0.9	0.01
21	0.95 - 1.00	1.43	1.0	1.0	1.0	0.00
					TOTAL =	8.72

MARQ. SSE = 0.65854004E 02

PROBLEM EXECUTION TERMINATED.

APPENDIX C

MODEL I - Used with air photos, topographic maps, and ash maps. (Code 1, Hazard Rating Program, appendix D)

P = [1 + Exp (-(0.693877 + 0.000466631 * Elevation - 0.0121644 * Slope -0.473561 * Cosine of Aspect * tangent of Slope + 0.946403 * Sine of Aspect * Tangent of Slope - 0.533065 * Topographic Position - 0.189016 * Level -0.00222074 * Density - 0.878437 * Ash))] -1

MODEL II - Used with air photos, topographic maps, ash maps, and stand purity. (Codes 2 and 3, Hazard Rating Program, appendix D)

P = [1 + Exp (-(-2.33584 + 0.000837601 * Elev. - 0.0285806 * Slope + 0.994925 * Sin (Asp.) * Tan (Slope) - 0.276313 * Cos (Asp.) * Tan (Slope) - 0.158771 * Topo - 0.281837 * Level + 0.0154319 * Density - 1.60835 * Ash + 3.34324 * Purity))] -1

MODEL III - Used with air photos, topographic maps, ash maps, stand age, and purity. (Codes 4 and 5, Hazard Rating Program, appendix D)

P = [1 + Exp (-(-3.95486 + 0.000593883 * Elev. - 0.0138702 * Slope + 1.41219 * Sin (Asp.) * Tan (Slope) - 0.301178 * Cos (Asp.) * Tan (Slope) + 0.0342283 * Topo - 0.353803 * Level + 0.00726717 * Density - 1.08193 * Ash + 0.0351754 * Age + 2.43902 * Purity))] -1

MODEL IV - Used with air photos, topographic maps, ash maps, and stand age. (Code 6, Hazard Rating Program, appendix D)

P = [1 + Exp (-(-2.41228 + 0.000283309 * Elev. + 0.000545688 * Slope - 0.305187 * Cos (Asp.) * Tan (Slope) + 1.5504 * Sin (Asp.) * Tan (Slope) - 0.141615 * Topo - 0.320876 * Level - 0.00632419 * Density - 0.466727 * Ash + 0.0448368 * Age))] -1

APPENDIX D

HAZARD RATING PROGRAM AND RESULTS

FREQUENCY BAR DISTRIBUTION CHART BY HAZARD RATING

APPENDIX D

HAZARD RATING PROGRAM AND RESULTS

FREQUENCY BAR DISTRIBUTION CHART BY HAZARD RATING

```
$JOB X
1        INTEGER COMP,SCOMP,STD,SSTD,CODE,AGE,EL,TO,DEN,ASH
2        WRITE(6,111)
3      111 FORMAT('1',40X,'PROBABILITY OF DEFOLIATION BY THE DOUGLAS FIR',/,4
        C2X,'TUSSOCK MOTH ON THE PALOUSE RANGER DISTRICT',/,41X,'----------
        C----------'//////)
4        WRITE(6,102)
5      102 FORMAT(23X,'STAND',6X,'CODE   ELEV    ASP     SL   TOPO    LEV
        CDEN    ASH    AGE    PUR     RISK',//)
6        N=15
7        DO 999 I=1,1000
8        READ(5,100)COMP,SCOMP,STD,SSTD,CODE,AGE,TOT,GF,SAF,DF,EL,AS,SL,TC,
        CL,DEN,ASH
9      100 FORMAT(I2,I1,2I2,2I3,2X,4F3.0,I7,F3.0,F4.0,2I5,I7,I3)
10       IF(COMP.EQ.0)GO TO 500
11       N=N+1
12       IF(N.GE.60)GO TO 60
13       GO TO 40
14      60 WRITE(6,113)
15     113 FORMAT('1',23X,'STAND',6X,'CODE   ELEV    ASP     SL   TOPO    LEV
        C    DEN    ASH    AGE    PUR     RISK',//)
16       N=7
17      40 IF(STD.EQ.1)GO TO 30
18       GO TO 31
19      30 IF(SSTD.GT.1)GO TO 31
20       WRITE(6,112)
21     112 FORMAT(//)
22       N=N+2
23      31 IF(AS.GE.1.0.AND.AS.LE.3.0)GO TO 25
24       ASP=(AS-4)*22.5
25       GO TO 26
26      25 ASP=(AS*22.5)+270.0
27      26 AS=(3.14159/180)*ASP
28       IF(SL.EQ.1)SL=.08
29       IF(SL.EQ.2)SL=.40
30       IF(SL.EQ.3)SL=.80
31       IF(CODE.EQ.1.0.OR.CODE.EQ.6.0)GO TO 99
32       IF(CODE.GE.7.0)GO TO 75
33       PUR=(GF+SAF+DF)/TOT
34      99 IF(CODE.EQ.1)GO TO 50
35       IF(CODE.EQ.2.0.OR.CODE.EQ.3.0)GO TO 51
36       IF(CODE.EQ.4.0.OR.CODE.EQ.5.0)GO TO 52
37       IF(CODE.EQ.6.0)GO TO 53
38      50 P=     -(0.693877+0.00046631*EL-0.0121644*SL-0.473561*COS(AS)*TAN(
        CSL)+0.946403*SIN(AS)*TAN(SL)-0.533065*TO-0.189016* L-0.00222074*DE
        CN-0.878437*ASH)
39       IF(P.GT.174.0)P=174.0
40       IF(P.LT.-180.0)P=-180.0
41       P=1/(1+EXP(P))
42       SL=SL*100
43       AS=(180/3.14159)*AS
44       WRITE(6,107)COMP,SCOMP,STD,SSTD,CODE,EL,AS,SL,TO,L,DEN,ASH,P
45     107 FORMAT(21X,I2,'-',I1,'-',I2,'-',I2,2I7,2F7.0,4I7,14X,F9.3)
46       WRITE(8,242)P
47     242 FORMAT(F5.3)
48       GO TO 999
49      51 P=       -(-2.33584+0.000837601*EL-0.0285606*SL+0.994925*SIN(AS)*T
        CAN(SL)-0.276313*COS(AS)*TAN(SL)-0.158771*TO-0.281837* L+0.0154319*
        CDEN-1.60835*ASH+3.34324*PUR)
50       IF(P.GT.174.0)P=174.0
```

```
51          IF(P.LT.-180.0)P=-180.0
52          P=1/(1+EXP(P))
53          SL=SL*100
54          AS=(180/3.14159)*AS
55          WRITE(6,108)COMP,SCOMP,STD,SSTD,CODE,EL,AS,SL,TC,L,DEN,ASH,PUR,P
56      108 FORMAT(21X,I2,'-',I1,'-',I2,'-',I2,2I7,2F7.0,4I7,7X,F7.2,F9.3)
57          WRITE(8,242)P
58          GO TO 999
59       52 P=        -(-3.95486+0.000593883*EL-0.0138702*SL+1.41219*SIN(AS)*TA
           CN(SL)-0.301178*COS(AS)*TAN(SL)+0.0342283*TC-0.353803* L+0.00726717
           C*DEN-1.08193*ASH+0.0351754*AGE+2.43902*PUR)
60          IF(P.GT.174.0)P=174.0
61          IF(P.LT.-180.0)P=-180.0
62          P=1/(1+EXP(P))
63          SL=SL*100
64          AS=(180/3.14159)*AS
65      106 WRITE(6,101)COMP,SCOMP,STD,SSTD,CODE,EL,AS,SL,TC,L,DEN,ASH,AGE,PUR
           C,P
66      101 FORMAT(21X,I2,'-',I1,'-',I2,'-',I2,2I7,2F7.0,5I7,F7.2,F9.3)
67          WRITE(8,242)P
68          GO TO 999
69       53 P=        -(-2.41228+0.000283309*EL+0.000545688*SL-0.305187*COS(AS)
           C*TAN(SL)+1.5504*SIN(AS)*TAN(SL)-0.141615*TC-0.320876* L-0.00632419
           C*DEN-0.466727*ASH+0.0448368*AGE)
70          IF(P.GT.174.0)P=174.0
71          IF(P.LT.-180.0)P=-180.0
72          P=1/(1+EXP(P))
73          SL=SL*100
74          AS=(180/3.14159)*AS
75          WRITE(6,109)COMP,SCOMP,STD,SSTD,CODE,EL,AS,SL,TC,L,DEN,ASH,AGE,P
76      109 FORMAT(21X,I2,'-',I1,'-',I2,'-',I2,2I7,2F7.0,5I7,7X,F9.3)
77          WRITE(8,242)P
78          GO TO 999
79       75 WRITE(6,105)COMP,SCOMP,STD,SSTD,CODE
80      105 FORMAT(21X,I2,'-',I1,'-',I2,'-',I2,I7)
81      999 CONTINUE
82      500 WRITE(6,110)
83      110 FORMAT('1')
84          WRITE(6,104)
85      104 FORMAT(8X,'KEY TO CODES'//' 1=MAP AND PHOTO MODEL'/' 2=MAP AND PHO
           CTO MODEL WITH PURITY BASED ON BA/ACRE'/' 3=MAP AND PHOTO MODEL WIT
           CH PURITY BASED ON TREES/ACRE'/' 4=MAP AND PHOTO MODEL WITH PURITY
           CBASED ON BA/ACRE AND AGE'/' 5=MAP AND PHOTO MODEL WITH PURITY BASE
           CD ON TREES/ACRE AND AGE'/' 6=MAP AND PHOTO MODEL WITH AGE ONLY'/'
           C7=CLEARCUT OR RECENT CLEARCUT'/' 8=STAND WITH NO HOST SPECIES'///'
           C SLOPE IS IN PERCENT'///' TOPOGRAPHIC POSITION'/' 1=RIDGETOP'/' 2=
           CSIDEHILL'/' 3=VALLEY'///' LEVEL 1=SINGLE-STORY'/'        2=MULTI-ST
           CORY'///' ASH 0=ABSENT'/'      1=PRESENT')
86          WRITE(6,110)
87          STOP
88          END

$ENTRY
```

PROBABILITY OF DEFOLIATION BY THE DOUGLAS FIR TUSSOCK MOTH ON THE PALOUSE RANGER DISTRICT

STAND	CODE	ELEV	ASP	SL	TOPO	LEV	DEN	ASH	AGE	PUR	RISK
44-1- 1- 0	5	4000	67.	40.	2	2	43	1	64	0.96	0.892
44-1- 2- 0	4	4000	135.	40.	2	2	45	1	64	0.66	0.800
44-1- 3- 1	6	4400	225.	8.	2	2	80	1	79		0.601
44-1- 3- 2	6	4000	157.	40.	2	2	43	1	79		0.725
44-1- 3- 3	6	4000	270.	40.	2	2	65	1	79		0.451
44-1- 3- 4	6	3960	157.	40.	2	2	40	1	79		0.727
44-1- 3- 5	6	3900	292.	40.	2	2	55	1	79		0.460
44-1- 4- 0	1	3960	180.	8.	1	2	40	0			0.829
44-2- 1- 0	7										
44-2- 2- 0	7										
44-2- 3- 0	7										
44-2- 4- 0	5	3280	0.	40.	2	2	74	1	79	1.00	0.869
44-2- 5- 0	5	3760	292.	40.	2	2	25	1	79	0.71	0.657
44-2- 6- 0	5	3760	90.	40.	1	2	40	0	79	0.56	0.933
44-2- 7- 0	5	3760	0.	40.	2	2	55	0	79	0.42	0.847
44-2- 8- 0	5	3680	270.	40.	2	2	80	1	99	0.94	0.906
44-2- 9- 0	5	3800	180.	8.	1	2	70	1	89	0.67	0.865
44-2-10- 1	8										
44-2-10- 2	8										
44-2-11- 0	1	4000	22.	40.	2	1	100	1			0.542
44-2-12- 0	1	4160	315.	40.	3	1	90	1			0.341
44-2-13- 1	1	3600	22.	40.	2	1	95	0			0.705
44-2-13- 2	1	3600	247.	40.	2	2	50	1			0.411
44-2-14- 0	1	3600	270.	40.	2	1	85	1			0.413
44-3- 1- 0	7										
44-3- 2- 0	7										
44-3- 3- 0	7										
44-3- 4- 0	7										
44-3- 5- 0	1	3600	22.	40.	2	2	47	1			0.478
44-4- 1- 1	1	2980	45.	40.	2	2	80	0			0.645
44-4- 1- 2	1	2980	270.	40.	2	2	45	0			0.534
44-4- 2- 0	1	3360	22.	40.	2	2	57	0			0.658
44-4- 3- 1	6	3280	0.	40.	2	2	77	1	76		0.479
44-4- 3- 2	6	3280	22.	40.	1	2	85	1	76		0.567
44-4- 3- 3	6	3280	292.	40.	2	2	65	1	76		0.370
44-4- 3- 4	6	3360	337.	40.	1	2	40	1	76		0.519

STAND	CODE	ELEV	ASP	SL	TOPO	LEV	DEN	ASH	AGE	PUR	RISK
44-4- 3- 5	6	3360	90.	40.	2	2	80	1	76		0.669
44-4- 4- 0	3	3520	315.	40.	2	2	85	1		0.93	0.895
44-4- 5- 1	1	3280	270.	40.	2	2	62	1			0.345
44-4- 5- 2	1	3280	67.	40.	2	2	35	0			0.729
44-4- 5- 3	1	3520	0.	40.	2	2	57	0			0.637
44-4- 6- 0	2	3120	225.	40.	2	2	10	0		1.00	0.935
44-4- 7- 0	4	3360	202.	40.	2	2	56	1	62	0.71	0.629
44-4- 8- 0	6	3120	0.	40.	2	2	25	1	157		0.979
44-4- 9- 0	5	3200	337.	40.	2	2	92	1	154	1.00	0.988
44-4-10- 0	5	3300	202.	40.	2	2	82	0	154	0.79	0.994
44-4-11- 0	5	3240	0.	40.	2	2	95	0	154	1.00	0.997
44-4-12- 1	1	3280	292.	40.	2	2	97	1			0.318
44-4-12- 2	1	3200	22.	40.	3	2	92	1			0.287
44-4-12- 3	1	3320	90.	40.	2	2	97	1			0.525
44-4-13- 0	6	3520	67.	40.	2	2	90	1	154		0.983
44-4-14- 0	5	3600	225.	8.	1	1	100	0	154	0.55	0.995
44-4-15- 1	6	3520	270.	40.	2	2	98	1	149		0.931
44-4-15- 2	6	3680	67.	40.	2	2	95	1	149		0.980
44-4-16- 1	6	3200	315.	40.	2	2	85	0	154		0.967
44-4-16- 2	6	3120	22.	8.	3	2	97	0	154		0.976
44-4-16- 3	6	3200	112.	40.	2	2	75	0	154		0.991
44-4-17- 0	6	3600	22.	8.	1	2	95	0	149		0.981
44-4-18- 0	6	3200	67.	40.	2	2	82	0	129		0.967
44-4-19- 1	1	3680	45.	40.	2	2	100	1			0.501
44-4-19- 2	1	3760	270.	40.	2	2	100	1			0.377
44-4-20- 1	1	3600	0.	40.	2	1	100	0			0.666
44-4-20- 2	1	3600	337.	40.	3	1	92	0			0.510
44-4-20- 3	1	3600	315.	40.	1	2	97	0			0.694
44-4-20- 4	1	3600	225.	40.	2	2	70	0			0.652
44-4-21- 1	6	2960	45.	40.	3	2	65	1	149		0.972
44-4-21- 2	6	3040	135.	40.	2	2	30	1	149		0.984
44-4-22- 0	1	3200	270.	40.	2	2	37	0			0.564
44-4-23- 0	8										
44-5- 1- 0	7										
44-5- 2- 1	1	3400	0.	40.	2	2	75	0			0.614
44-5- 2- 2	1	3400	202.	40.	2	2	75	0			0.667
44-5- 2- 3	1	3400	315.	40.	3	1	85	0			0.469
44-5- 2- 4	1	3400	67.	40.	2	2	95	0			0.714
44-5- 2- 5	1	3400	315.	8.	1	2	65	1			0.566
52-1- 1- 0	1	3760	315.	40.	2	2	40	1			0.403
52-1- 2- 1	1	3680	180.	40.	2	2	32	0			0.749
52-1- 2- 2	1	3760	202.	40.	2	2	23	0			0.727
52-1- 3- 1	1	3600	315.	40.	2	1	98	1			0.400
52-1- 3- 2	1	3760	270.	40.	2	2	65	1			0.396
52-1- 4- 1	1	3600	270.	40.	1	2	92	1			0.494
52-1- 4- 2	1	3560	270.	40.	2	2	95	1			0.358
52-1- 4- 3	1	3560	67.	40.	2	2	95	1			0.527
52-1- 5- 1	1	3700	337.	8.	2	2	85	0			0.673
52-1- 5- 2	1	3450	225.	40.	2	2	65	0			0.639

STAND	CODE	ELEV	ASP	SL	TOPO	LEV	DEN	ASh	AGE	PUR	RISK
52-1- 5- 3	1	3450	45.	40.	2	2	91	1			0.479
52-1- 5- 4	1	3450	202.	40.	2	2	70	0			0.675
52-1- 6- 0	1	2900	270.	40.	2	2	90	1			0.293
52-1- 7- 0	1	2840	180.	40.	2	2	85	1			0.426
52-1- 8- 0	1	3000	180.	40.	2	2	50	0			0.676
52-1- 9- 0	1	3220	225.	40.	2	2	80	0			0.605
52-1-10- 0	1	3360	45.	40.	2	2	80	1			0.475
52-1-11- 1	1	3000	22.	40.	2	2	85	0			0.604
52-1-11- 2	1	3120	292.	40.	2	2	90	0			0.514
52-1-12- 0	1	3040	202.	40.	2	2	27	1			0.440
52-1-13- 0	1	2880	202.	40.	2	2	75	0			0.612
52-1-14- 1	1	2960	270.	40.	2	2	85	0			0.509
52-1-14- 2	1	3000	45.	40.	2	2	67	0			0.654
52-1-15- 0	1	3040	337.	40.	2	2	70	0			0.542
52-1-16- 0	1	2800	292.	40.	2	1	98	1			0.310
52-1-17- 0	1	3080	202.	40.	2	2	40	1			0.437
52-1-18- 0	1	3000	292.	40.	2	2	95	0			0.497
52-2- 1- 0	7										
52-2- 2- 1	6	3280	112.	40.	2	2	50	0	72		0.761
52-2- 2- 2	6	3280	270.	40.	2	2	75	0	72		0.423
52-2- 2- 3	6	3280	67.	40.	2	2	65	0	72		0.724
52-2- 3- 0	7										
52-2- 4- 0	3	3400	247.	40.	2	2	75	1		0.90	0.861
52-2- 5- 0	7										
52-2- 6- 0	7										
52-2- 7- 0	7										
52-2- 8- 0	5	3600	157.	40.	2	2	45	0	79	0.93	0.963
52-2- 9- 0	5	3280	67.	40.	2	2	100	1	106	1.00	0.975
52-2-10- 0	1	2920	90.	40.	2	2	75	1			0.491
52-2-11- 0	1	2700	180.	8.	3	2	50	0			0.476
52-2-12- 1	1	3640	90.	40.	2	2	95	1			0.563
52-2-12- 2	1	3440	225.	40.	2	2	80	1			0.414
52-2-12- 3	1	3600	67.	40.	2	2	92	1			0.534
52-2-12- 4	1	3600	315.	40.	2	2	100	1			0.354
52-2-12- 5	1	3440	67.	40.	2	2	80	1			0.522
52-2-13- 1	1	2720	270.	40.	2	2	75	0			0.487
52-2-13- 2	1	2720	112.	40.	2	2	82	0			0.685
52-2-14- 1	1	3080	315.	40.	2	2	85	1			0.308
52-2-14- 2	1	3120	135.	40.	2	2	30	0			0.742
52-2-15- 0	1	3000	135.	40.	2	2	75	1			0.506
52-2-16- 0	1	3760	135.	40.	2	2	85	1			0.588
52-2-17- 0	7										
52-2-18- 0	1	3500	180.	8.	3	2	50	0			0.569
52-2-19- 0	7										
52-2-20- 0	1	3520	22.	40.	2	2	87	1			0.446
52-2-21- 0	1	3400	22.	40.	2	2	85	1			0.433
52-2-22- 0	1	3100	157.	8.	3	2	92	1			0.298
52-2-23- 0	1	3000	112.	8.	3	2	90	1			0.294
52-2-24- 0	1	3600	112.	40.	2	2	60	0			0.775
52-2-25- 0	1	2800	225.	8.	2	2	65	0			0.595
52-3- 1- 1	1	3360	135.	40.	2	2	60	1			0.556

STAND	CODE	ELEV	ASP	SL	TOPO	LEV	DEN	ASH	AGE	PUR	RISK
52-3- 1- 2	1	3440	315.	40.	2	2	60	1			0.358
52-3- 1- 3	1	3440	202.	40.	2	2	35	1			0.481
52-3- 2- 0	7										
52-3- 3- 0	7										
52-3- 4- 0	5	3819	180.	40.	2	1	92	1	69	1.00	0.930
52-3- 5- 0	1	3550	315.	40.	2	2	85	1			0.357
52-3- 6- 0	1	3280	225.	40.	2	2	75	1			0.399
52-3- 7- 0	1	3520	67.	40.	2	2	60	1			0.542
52-3- 8- 0	1	3200	180.	8.	3	2	87	1			0.305
52-3- 9- 0	1	4000	0.	40.	2	2	93	1			0.457
52-3-10- 1	1	3600	157.	40.	2	1	95	1			0.590
52-3-10- 2	1	3600	270.	40.	2	1	100	1			0.404
52-3-11- 0	1	3600	270.	40.	2	1	95	1			0.407
52-3-12- 0	1	3700	270.	40.	2	2	85	1			0.378
52-3-13- 0	1	3200	225.	40.	2	1	95	1			0.425
52-3-14- 1	1	3600	337.	40.	2	2	82	1			0.384
52-3-14- 2	1	3440	157.	40.	2	2	87	1			0.529
52-3-15- 0	1	3520	337.	40.	2	2	82	1			0.375
52-3-16- 0	1	3440	202.	40.	2	2	82	1			0.455
52-3-17- 0	1	2920	225.	8.	3	2	65	1			0.275
52-3-18- 0	1	3080	292.	40.	2	2	90	1			0.301
52-3-19- 0	1	3200	270.	40.	2	2	87	1			0.324
52-3-20- 0	1	3280	315.	40.	2	2	92	1			0.325
52-3-21- 0	1	3400	337.	40.	2	2	95	1			0.355
52-3-22- 0	1	3600	337.	40.	2	2	93	1			0.378
52-3-23- 0	1	3040	225.	40.	2	2	97	1			0.361
52-3-24- 0	1	3120	0.	40.	2	2	75	1			0.367
52-3-25- 0	1	3200	225.	40.	2	2	85	1			0.385
52-3-26- 0	1	3440	180.	40.	2	2	75	1			0.501
52-3-27- 0	1	3640	180.	40.	2	2	80	1			0.522
52-3-28- 0	1	3680	180.	8.	2	2	15	1			0.523
52-3-29- 0	1	3600	337.	40.	2	2	80	0			0.601
52-3-30- 0	1	3600	180.	40.	2	2	90	1			0.512
52-3-31- 1	1	3760	247.	40.	2	2	95	1			0.405
52-3-31- 2	1	3760	157.	8.	1	2	85	1			0.630
52-3-32- 0	1	3700	247.	8.	1	2	65	1			0.606
52-4- 1- 0	7										
52-4- 2- 0	7										
52-4- 3- 1	6	2960	247.	40.	2	2	35	0	59		0.347
52-4- 3- 2	6	3000	67.	40.	2	2	25	1	59		0.522
52-4- 3- 3	6	3120	225.	40.	2	2	25	1	59		0.309
52-4- 3- 4	6	3120	292.	8.	3	2	32	1	59		0.322
52-4- 4- 0	5	3560	180.	40.	2	2	21	1	46	0.57	0.429
52-4- 5- 1	5	3520	270.	40.	2	2	35	1	69	0.88	0.657
52-4- 5- 2	5	3800	22.	40.	2	2	55	1	69	0.88	0.841
52-4- 6- 1	6	3760	315.	40.	2	2	80	1	77		0.414
52-4- 6- 2	6	3760	45.	40.	2	2	80	1	77		0.641
52-4- 6- 3	6	3680	315.	8.	3	2	75	1	77		0.492
52-4- 7- 1	1	3800	337.	40.	2	2	80	0			0.623
52-4- 7- 2	1	3800	202.	40.	2	2	25	0			0.730
52-4- 7- 3	1	3750	247.	8.	3	1	85	1			0.385

STAND	CODE	ELEV	ASP	SL	TOPO	LEV	DEN	ASH	AGE	PUR	RISK
52-4- 7- 4	1	3800	0.	40.	2	2	60	1			0.452
52-4- 7- 5	1	3800	270.	8.	1	2	50	0			0.797
52-4- 7- 6	1	3780	202.	40.	2	2	50	0			0.717
52-4- 8- 0	1	3400	315.	40.	2	2	55	1			0.356
52-4- 9- 0	1	2800	225.	8.	3	2	55	0			0.468
52-4-10- 0	1	3520	0.	40.	2	2	85	1			0.406
52-4-11- 0	1	2720	247.	40.	2	2	80	0			0.511
52-4-12- 0	7										
52-5- 1- 1	6	3360	247.	40.	2	2	83	0	67		0.386
52-5- 1- 2	6	3280	315.	40.	2	2	80	1	67		0.283
52-5- 1- 3	6	3360	0.	40.	2	1	90	1	67		0.444
52-5- 2- 0	1	3500	225.	8.	1	2	60	0			0.778
52-5- 3- 0	7										
52-5- 4- 1	1	3280	315.	40.	2	2	85	1			0.328
52-5- 4- 2	1	3360	67.	40.	2	2	85	1			0.510
52-5- 4- 3	1	3360	270.	40.	2	1	90	1			0.383
52-5- 4- 4	1	3440	67.	40.	2	1	95	1			0.560
52-5- 4- 5	1	3400	22.	40.	2	2	70	1			0.442
52-5- 4- 6	1	3360	45.	40.	2	2	70	1			0.480
52-5- 4- 7	1	3550	180.	8.	2	2	50	0			0.697
52-5- 5- 1	1	3300	270.	40.	2	2	70	1			0.343
52-5- 5- 2	1	3360	67.	40.	2	2	88	1			0.508
52-5- 5- 3	1	3280	225.	40.	2	2	85	1			0.393
52-5- 5- 4	1	3300	0.	40.	2	2	95	1			0.376
52-5- 5- 5	1	3360	135.	8.	2	2	83	0			0.671
52-5- 5- 6	1	3440	225.	40.	2	2	80	0			0.630
52-5- 5- 7	1	3360	315.	40.	2	1	90	0			0.593
52-5- 5- 8	1	3360	0.	40.	3	1	85	1			0.310
52-5- 5- 9	1	3600	45.	8.	1	2	48	1			0.623
52-5- 5-10	1	3450	135.	40.	2	2	50	1			0.572
52-5- 6- 0	1	3300	225.	40.	2	2	55	0			0.627
52-5- 7- 0	1	3280	180.	40.	2	2	70	0			0.694
52-5- 8- 0	1	3280	135.	40.	2	2	75	0			0.738
52-6- 1- 0	7										
52-6- 2- 1	6	3600	292.	40.	2	2	73	0	89		0.636
52-6- 2- 2	6	3200	67.	40.	2	2	85	0	89		0.829
52-6- 2- 3	6	3240	292.	40.	2	2	63	1	89		0.513
52-6- 2- 4	6	3440	315.	40.	2	2	90	0	89		0.623
52-6- 2- 5	6	3760	292.	40.	2	2	95	1	89		0.499
52-6- 2- 6	6	3440	0.	40.	2	2	97	1	89		0.603
52-6- 2- 7	6	3280	270.	40.	2	2	90	1	89		0.473
52-6- 3- 1	6	3440	225.	40.	2	2	20	0	79		0.664
52-6- 3- 2	6	3520	292.	40.	2	1	100	0	79		0.559
52-6- 3- 3	6	3520	90.	40.	2	1	96	1	79		0.751
52-6- 4- 1	6	4160	112.	40.	2	2	95	0	99		0.912
52-6- 4- 2	6	4000	292.	40.	2	1	100	0	99		0.780
52-6- 4- 3	6	3840	112.	40.	2	2	70	0	99		0.917
52-6- 4- 4	6	3680	315.	40.	2	2	95	0	99		0.729
52-6- 4- 5	6	3520	112.	40.	2	2	63	0	99		0.913

STAND	CODE	ELEV	ASP	SL	TOPO	LEV	DEN	ASH	AGE	PUR	RISK
52-6- 4- 6	6	3360	315.	40.	2	2	90	0	99		0.717
52-6- 5- 0	4	4000	202.	40.	2	2	4	0	204	0.43	0.997
52-6- 6- 1	1	3290	180.	40.	1	2	50	0			0.803
52-6- 6- 2	1	3290	270.	40.	2	2	85	0			0.548
52-6- 7- 1	1	3680	270.	40.	2	1	68	1			0.431
52-6- 7- 2	1	3680	315.	40.	2	1	98	1			0.409
52-6- 8- 0	4	3800	135.	40.	2	2	13	0	104	0.75	0.977
52-6- 9- 1	6	3760	202.	40.	2	2	25	0	204		0.999
52-6- 9- 2	6	3600	180.	40.	1	2	20	0	204		0.999
52-6- 9- 3	6	3640	225.	40.	2	2	38	0	204		0.998
52-6- 9- 4	6	3760	247.	40.	1	2	35	0	204		0.998
52-6-10- 1	6	3680	157.	40.	2	2	11	0	109		0.948
52-6-10- 2	6	3440	157.	40.	2	2	32	0	109		0.937
52-6-10- 3	6	3600	112.	40.	2	2	18	0	109		0.957
52-6-10- 4	6	3200	157.	40.	2	2	15	0	109		0.939
52-6-10- 5	6	3360	180.	40.	1	2	33	0	109		0.929
52-6-11- 0	4	3840	292.	40.	2	1	98	1	79	0.95	0.896
52-6-12- 1	6	3120	337.	40.	2	2	66	1	74		0.404
52-6-12- 2	6	3120	337.	40.	2	2	83	1	74		0.378
52-6-13- 1	6	3120	337.	40.	2	1	96	1	51		0.216
52-6-13- 2	6	3160	112.	40.	2	1	89	1	51		0.448
52-6-13- 3	6	3120	135.	40.	2	1	85	1	51		0.427
52-6-14- 0	1	3200	157.	40.	2	2	45	0			0.726
52-6-15- 0	1	3280	90.	40.	2	1	98	1			0.567
52-6-16- 0	1	3360	45.	40.	2	1	95	1			0.513
52-6-17- 1	6	3280	90.	40.	2	1	83	0	59		0.666
52-6-17- 2	6	3280	247.	40.	2	1	50	0	59		0.422
52-6-18- 0	1	3600	90.	40.	1	2	13	0			0.862
52-6-19- 0	4	3440	337.	40.	2	2	93	1	79	0.68	0.756
52-6-20- 0	4	3500	180.	8.	1	2	23	0	54	0.41	0.629
52-6-21- 1	6	3760	112.	40.	2	2	5	0	69		0.809
52-6-21- 2	6	3680	135.	40.	2	2	5	0	69		0.790
52-6-21- 3	6	3600	270.	40.	2	2	20	0	69		0.499
53-1- 1- 0	7										
53-1- 2- 0	7										
53-1- 3- 1	6	3800	337.	40.	2	2	33	1	64		0.393
53-1- 3- 2	6	3950	45.	40.	2	2	25	1	64		0.598
53-1- 4- 0	1	3800	180.	40.	2	2	86	0			0.736
53-1- 5- 0	7										
53-1- 6- 0	1	3600	157.	40.	2	2	75	1			0.554
53-1- 7- 0	1	3400	67.	40.	2	2	100	1			0.506
53-2- 1- 0	7										
53-2- 2- 0	1	3600	202.	40.	2	2	27	1			0.505
53-2- 3- 0	1	3600	337.	40.	2	2	37	1			0.381
53-2- 4- 1	1	3700	135.	40.	2	2	80	1			0.584
53-2- 4- 2	1	3460	225.	40.	2	2	62	1			0.426
53-2- 5- 0	1	3600	225.	8.	1	2	5	1			0.633
53-2- 6- 0	1	3200	270.	40.	2	2	92	1			0.322
53-2- 7- 0	1	3120	180.	8.	3	2	67	1			0.306

STAND	CODE	ELEV	ASP	SL	TOPO	LEV	DEN	ASH	AGE	PUR	RISK
53-2- 8- 1	1	3360	270.	40.	2	2	90	1			0.339
53-2- 8- 2	1	3360	202.	40.	2	2	95	1			0.439
53-2- 9- 0	1	3200	202.	8.	3	2	80	1			0.301
53-2-10- 0	1	3280	135.	40.	2	2	75	1			0.539
53-2-11- 0	1	3425	315.	40.	2	2	92	1			0.340
53-2-12- 1	1	3280	135.	40.	2	2	90	1			0.530
53-2-12- 2	1	3440	270.	40.	2	2	95	1			0.345
53-2-13- 0	1	3950	135.	40.	2	2	85	1			0.610
53-2-14- 1	1	3950	315.	40.	2	1	94	1			0.442
53-2-14- 2	1	3750	135.	40.	2	2	75	1			0.592
53-2-15- 1	1	3400	315.	40.	2	2	87	1			0.340
53-2-15- 2	1	3400	135.	40.	2	2	82	1			0.549
53-2-15- 3	1	3200	225.	40.	2	2	100	1			0.377
53-2-16- 1	1	3600	337.	40.	2	2	85	1			0.382
53-2-16- 2	1	3450	157.	40.	2	2	75	1			0.537
53-2-17- 0	1	3400	247.	40.	2	2	73	1			0.377
53-2-18- 1	1	3600	135.	40.	2	2	44	1			0.592
53-2-18- 2	1	3400	67.	40.	3	2	90	1			0.381
53-2-18- 3	1	3420	67.	40.	1	2	80	1			0.648
53-2-18- 4	1	3470	90.	40.	2	2	92	1			0.545
53-3- 1- 1	1	4480	202.	40.	1	2	65	1			0.706
53-3- 1- 2	1	3350	135.	40.	2	2	95	1			0.536
53-3- 2- 0	1	4200	157.	40.	2	2	30	1			0.645
53-3- 3- 0	1	3700	112.	40.	2	2	83	1			0.588
53-3- 4- 0	1	2900	112.	40.	2	2	75	0			0.706
53-3- 5- 0	1	4020	180.	40.	2	2	92	1			0.559
53-3- 6- 0	1	4000	90.	40.	2	2	77	1			0.614
53-3- 7- 0	1	4000	112.	40.	2	1	90	1			0.661
53-3- 8- 1	1	3740	315.	40.	2	2	95	1			0.372
53-3- 8- 2	1	3680	270.	40.	2	2	95	1			0.371
53-3- 8- 3	1	3600	112.	40.	2	2	95	1			0.570
53-3- 9- 0	1	3680	135.	40.	2	2	75	0			0.772
53-3-10- 0	1	3680	292.	40.	2	2	95	1			0.360
53-3-11- 0	1	3680	135.	40.	2	2	60	1			0.593
53-3-12- 0	1	3600	112.	40.	2	2	88	0			0.764
53-3-13- 0	1	3420	90.	40.	3	1	95	0			0.665
53-3-14- 0	1	3580	270.	40.	2	2	67	1			0.375
53-3-15- 0	1	3400	180.	40.	2	2	95	0			0.694
53-3-16- 1	1	3560	270.	40.	2	2	90	1			0.361
53-3-16- 2	1	3560	135.	40.	2	2	75	0			0.762
53-3-17- 1	1	3400	0.	40.	2	2	100	1			0.385
53-3-17- 2	1	3350	135.	40.	2	2	85	0			0.740
53-3-17- 3	1	3500	247.	8.	2	2	95	0			0.649
53-3-18- 1	1	3250	337.	40.	2	1	95	0			0.599
53-3-18- 2	1	3250	180.	40.	2	2	95	0			0.679
53-3-19- 0	1	3440	270.	8.	1	2	90	0			0.752
53-3-20- 0	1	3280	225.	40.	2	2	73	1			0.400
53-3-21- 0	1	3200	90.	40.	2	2	91	0			0.718
53-3-22- 1	1	3280	315.	40.	2	2	80	1			0.331
53-3-22- 2	1	3200	225.	40.	2	2	98	0			0.594
53-3-22- 3	1	3200	157.	40.	2	2	95	1			0.497

STAND	CODE	ELEV	ASP	SL	TOPO	LEV	DEN	ASH	AGE	PUR	RISK
53-3-23- 0	1	3200	0.	40.	2	1	100	1			0.408
53-3-24- 0	1	3000	247.	40.	2	1	77	1			0.375
53-3-25- 1	1	3000	247.	40.	2	1	100	0			0.579
53-3-25- 2	1	3000	67.	40.	2	1	100	0			0.712
53-3-25- 3	1	3000	247.	40.	2	2	95	0			0.535
53-3-25- 4	1	2960	90.	40.	2	2	85	0			0.698
53-3-26- 1	1	3000	292.	40.	2	2	82	0			0.504
53-3-26- 2	1	3000	112.	40.	2	2	87	0			0.711
53-3-27- 0	1	3150	247.	40.	2	2	93	0			0.554
53-3-28- 0	1	3280	315.	40.	2	2	92	1			0.325
53-3-29- 0	1	3840	112.	40.	3	2	80	1			0.473
53-3-30- 1	1	2900	225.	40.	2	2	65	0			0.577
53-3-30- 2	1	2840	180.	8.	3	2	75	0			0.478
53-4- 1- 0	1	3760	337.	40.	2	2	85	1			0.400
53-4- 2- 0	1	3280	90.	40.	3	2	67	1			0.405
53-4- 3- 0	1	3360	45.	40.	2	2	55	1			0.488
53-4- 4- 0	1	3600	112.	40.	2	2	60	1			0.589
53-5- 1- 0	7										
53-5- 2- 0	7										
53-5- 3- 0	7										
53-5- 4- 0	7										
53-5- 5- 0	7										
53-5- 6- 0	7										
53-5- 7- 0	7										
53-5- 8- 0	7										
53-5- 9- 0	7										
53-5-10- 0	6	3600	67.	40.	2	1	30	1	31		0.330
53-5-11- 0	7										
53-5-12- 0	7										
53-5-13- 0	7										
53-5-14- 0	6	3640	337.	40.	2	1	47	0	39		0.288
53-5-15- 0	1	3760	202.	40.	3	2	47	1			0.381
53-5-16- 1	1	4000	135.	40.	3	2	55	1			0.501
53-5-16- 2	1	4240	337.	40.	2	1	95	1			0.496
51-5-17- 0	7										
53-5-18- 0	1	4480	180.	40.	2	2	22	1			0.648
53-5-19- 0	7										
54-1- 1- 0	7										
54-1- 2- 0	3	3280	135.	40.	2	2	70	1		1.00	0.938
54-1- 3- 0	4	3360	157.	40.	2	2	37	1	74	0.80	0.814
54-1- 4- 0	5	3200	135.	40.	2	2	80	1	99	0.72	0.927
54-1- 5- 1	6	3300	315.	40.	2	2	62	1	174		0.982
54-1- 5- 2	6	3300	225.	40.	2	2	27	1	174		0.988
54-1- 6- 0	5	3680	180.	40.	1	2	60	0	89	0.95	0.973
54-1- 7- 0	5	3000	135.	8.	3	2	45	0	89	0.86	0.947
54-1- 8- 0	7										
54-1- 9- 0	5	3100	135.	8.	3	2	60	1	149	0.83	0.982

STAND	CODE	ELEV	ASP	SL	TOPO	LEV	DEN	ASH	AGE	PUR	RISK
54-1-10- 0	3	3200	202.	40.	2	2	22	0		0.97	0.951
54-1-11- 0	7										
54-1-12- 0	2	3240	292.	40.	2	2	80	1		0.65	0.700
54-1-13- 0	7										
54-1-14- 0	3	3200	112.	40.	2	2	70	0		0.79	0.974
54-1-15- 0	7										
54-1-16- 0	1	3600	90.	40.	2	2	55	1			0.580
54-1-17- 0	5	2900	67.	8.	3	2	40	0	119	0.93	0.982
54-1-18- 0	5	2960	157.	40.	2	1	85	1	149	0.68	0.987
54-1-19- 0	3	3000	270.	40.	2	2	70	1		1.00	0.843
54-1-20- 0	7										
54-1-21- 1	1	3520	202.	40.	2	2	50	1			0.482
54-1-21- 2	1	3600	225.	8.	1	2	35	1			0.617
54-1-21- 3	1	3600	292.	8.	2	2	45	1			0.466
54-1-21- 4	1	3440	157.	40.	2	2	52	1			0.548
54-1-21- 5	1	3520	247.	40.	2	2	55	1			0.400
54-1-21- 6	1	3360	225.	8.	3	2	55	1			0.322
54-1-21- 7	1	3360	315.	40.	2	2	50	1			0.354
54-1-21- 8	1	3200	157.	8.	2	2	60	1			0.449
54-1-22- 0	1	3450	292.	40.	2	1	100	1			0.377
54-2- 1- 0	7										
54-2- 2- 0	1	3840	135.	40.	1	2	30	1			0.741
54-2- 3- 0	7										
54-2- 4- 0	5	3140	67.	40.	2	2	60	1	99	0.43	0.840
54-2- 5- 1	1	3600	22.	40.	2	2	100	0			0.662
54-2- 5- 2	1	3600	292.	40.	2	2	100	1			0.349
54-2- 6- 0	5	3460	0.	40.	2	1	95	1	99	0.37	0.843
54-2- 7- 0	7										
54-2- 8- 1	6	3400	157.	40.	2	2	27	1	79		0.711
54-2- 8- 2	6	3400	135.	40.	2	2	97	1	79		0.655
54-2- 9- 1	4	3600	0.	40.	2	2	97	1	64	0.70	0.731
54-2- 9- 2	4	3540	112.	40.	3	2	87	1	64	0.70	0.839
54-2-10- 0	7										
54-2-11- 0	1	3400	67.	40.	1	2	70	0			0.818
54-2-12- 0	4	3680	45.	8.	1	2	85	1	84	0.55	0.811
54-2-13- 1	4	3500	67.	40.	3	2	95	1	99	0.54	0.919
54-2-13- 2	4	3400	337.	40.	2	2	98	1	99	0.54	0.818
54-2-14- 0	1	3520	135.	40.	2	2	95	1			0.555
54-2-15- 0	1	3680	0.	40.	2	2	80	1			0.427
54-2-16- 0	4	3400	180.	40.	2	2	62	1	75	0.94	0.863
54-2-17- 0	4	3520	135.	40.	2	2	50	1	84	1.00	0.936
54-2-18- 0	1	3680	112.	40.	2	2	50	1			0.603
54-2-19- 0	7										
54-2-20- 0	1	3600	90.	40.	2	2	90	1			0.561
54-2-21- 0	1	3400	22.	40.	2	2	55	1			0.450
54-2-22- 0	1	3600	157.	8.	1	2	85	1			0.613
54-2-23- 0	1	3800	135.	40.	1	2	80	0			0.858
54-2-24- 0	1	3600	337.	40.	2	1	95	1			0.422
54-2-25- 0	1	3520	0.	40.	2	2	75	0			0.627
54-2-26- 0	1	3760	45.	8.	1	2	57	1			0.636
54-2-27- 0	7										

STAND	CODE	ELEV	ASP	SL	TOPO	LEV	DEN	ASH	AGE	PUR	RISK
54-2-28- 0	1	3520	90.	40.	2	2	75	0			0.754
54-2-29- 0	7										
54-2-30- 0	7										
54-2-31- 0	7										
54-2-32- 0	7										
54-2-33- 0	1	3520	157.	40.	2	2	30	1			0.570
55-1- 1- 1	1	3440	135.	8.	2	2	82	1			0.469
55-1- 1- 2	1	3440	202.	8.	2	2	38	1			0.474
55-1- 2- 0	1	3040	180.	8.	3	2	92	0			0.492
55-1- 3- 1	1	3160	0.	40.	2	2	95	0			0.576
55-1- 3- 2	1	3200	225.	40.	2	2	95	0			0.595
55-1- 3- 3	1	3200	22.	40.	2	2	100	1			0.403
55-1- 3- 4	1	3600	225.	8.	1	2	95	1			0.586
55-1- 3- 5	1	3200	292.	40.	2	2	100	1			0.308
55-1- 3- 6	1	3200	225.	40.	2	2	60	0			0.614
55-1- 4- 1	1	3240	292.	40.	2	2	90	0			0.528
55-1- 4- 2	1	3400	135.	40.	2	2	45	1			0.569
55-1- 5- 0	1	2880	202.	8.	3	2	100	1			0.262
55-1- 6- 0	1	3360	247.	40.	2	2	72	0			0.589
55-1- 7- 0	1	3440	315.	40.	2	2	62	0			0.571
55-1- 8- 0	1	3440	270.	40.	2	2	80	1			0.353
55-1- 9- 0	1	3440	315.	40.	2	2	72	0			0.566
55-1-10- 0	1	3300	202.	8.	1	1	100	0			0.785
55-1-11- 0	1	3360	157.	40.	2	2	42	1			0.545
55-1-12- 0	1	3360	292.	40.	2	1	98	0			0.584
55-1-13- 1	1	3360	270.	40.	2	2	50	0			0.575
55-1-13- 2	1	3360	135.	40.	2	2	80	1			0.545
55-1-14- 0	1	3200	180.	40.	1	2	70	1			0.608
55-1-15- 1	1	3200	292.	40.	2	1	100	1			0.350
55-1-15- 2	1	3200	112.	40.	2	2	100	1			0.521
55-1-16- 0	1	3280	292.	40.	2	2	80	1			0.326
55-1-17- 0	1	3280	270.	40.	2	1	95	1			0.372
55-1-18- 0	1	3600	247.	40.	2	2	75	0			0.614

KEY TO CODES

1=MAP AND PHOTO MODEL
2=MAP AND PHOTO MODEL WITH PURITY BASED ON BA/ACRE
3=MAP AND PHOTO MODEL WITH PURITY BASED ON TREES/ACRE
4=MAP AND PHOTO MODEL WITH PURITY BASED ON BA/ACRE AND AGE
5=MAP AND PHOTO MODEL WITH PURITY BASED ON TREES/ACRE AND AGE
6=MAP AND PHOTO MODEL WITH AGE ONLY
7=CLEARCUT OR RECENT CLEARCUT
8=STAND WITH NO HOST SPECIES

SLOPE IS IN PERCENT

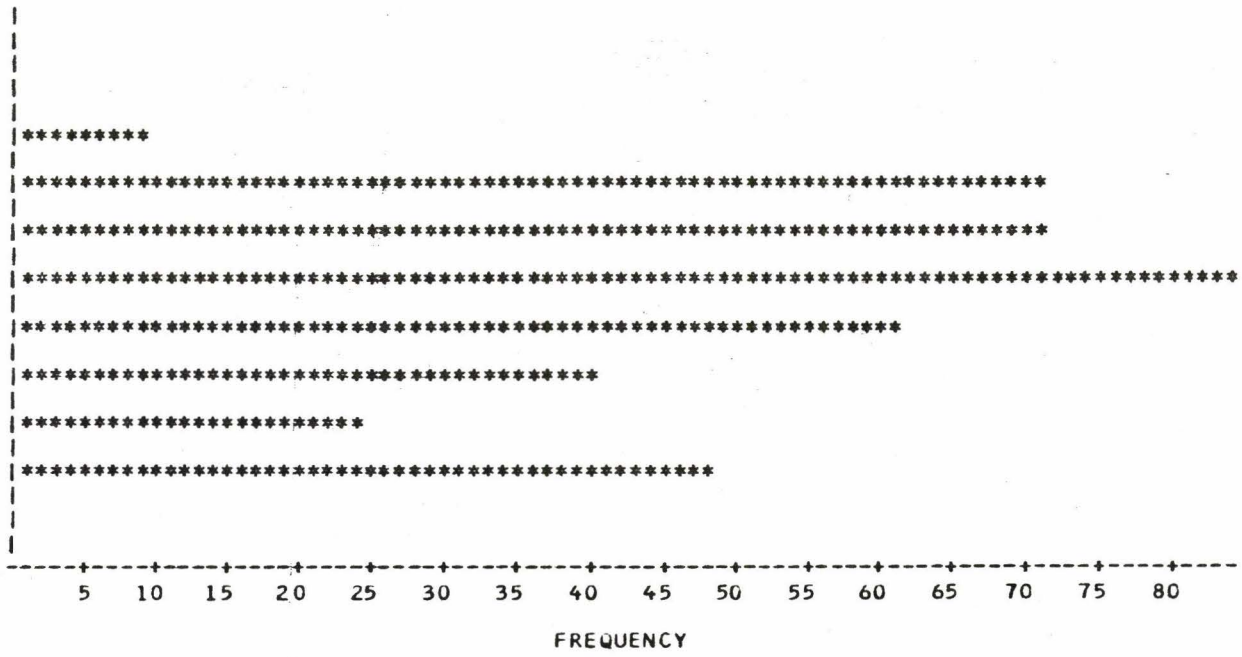
TOPOGRAPHIC POSITION
1=RIDGETOP
2=SIDEHILL
3=VALLEY

LEVEL 1=SINGLE-STORY
2=MULTI-STORY

ASH 0=ABSENT
1=PRESENT

```
CORE USAGE       OBJECT CODE=   12336 BYTES,ARRAY AREA=       0 BYTES,TOTAL AREA AVAILABLE=  202368  BYTES
DIAGNOSTICS        NUMBER OF ERRORS=       0, NUMBER OF WARNINGS=       0, NUMBER OF EXTENSIONS=       0
COMPILE TIME=     1.35 SEC,EXECUTION TIME=    13.34 SEC,  WATFIV - JUL 1973 V1L4      18.06.28    TUESDAY      10 JUN 80
```

FREQUENCY BAR CHART



MIDPOINT RISK	FREQ	CUM. FREQ	PERCENT	CUM. PERCENT
0.05	0	0	0.00	0.00
0.15	0	0	0.00	0.00
0.25	9	9	2.21	2.21
0.35	71	80	17.40	19.61
0.45	71	151	17.40	37.01
0.55	84	235	20.59	57.60
0.65	61	296	14.95	72.55
0.75	40	336	9.80	82.35
0.85	24	360	5.88	88.24
0.95	48	408	11.76	100.00
1.05	0	408	0.00	100.00

APPENDIX E

Work materials drafted for figures 1, 3, 4, and 5, appendix A:

1. Slope comparator: 3 to 10 days, depending upon photographic services.

2. Random plot sample grid: 3 to 10 days.

3. Plot circle: 1/2 hour.

4. Aspect transparency - 1 hour.

Planning and interpretation:

1. Planning: 1 week or more.

2. Stand tracing: 1 to 3 7½-minute quadrangles/day.

3. Transfer of stands to photos: 7 to 20 stands/hour.

4. Substand decisions and delineation: 15 to 25/hour.

5. Photointerpretation: 15 to 30 stands/hour.

6. Soils interpretation of ash presence: 75 to 100 stands/hour.

7. Stand age and purity: 30 to 60 stands/hour.

8. Transfer stands and substands from photos to final maps: 15 to 30 stands/hour.

9. Running RISK and Model Evaluation programs to find significant independent variables: 1 to 2 weeks.

10 Running prediction equation: 3 to 5 days.

11 Data card punching: 400 to 600 cards/hour.

Materials costs:

1. Orthophoto Quads: $1.25/quad for diazo prints; $18/quad for photographic prints.

2. Aerial photos: $2/print.

3. Maps: $1.25/7½-minute quad.

4. Computer time: $250 to $500, includes RISK, Model Evaluation, and probability runs.

5. Incidental costs: Mylar, special pens, long-distance calls, photographic work -$50 to $100.

6. Computer card punching by professionals: $10 to $15/1,000 cards.

APPENDIX F

COLOR-CODED STAND MAPS

WEST DENNIS

1979

1:24,000

This overlay made to fit over maps made by the Univ. of Idaho Cartographic Dept.

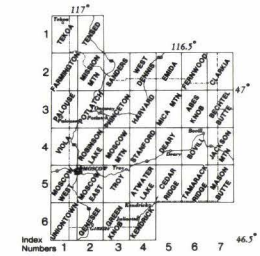
This sheet is one of a series of 37 which depicts Latah County, Idaho at a large scale. Information displayed is current to 1979.

Each sheet comprises nine separations. Additional information can be added by creating new separations. Any group of separations can be selectively combined to meet individual requirements.

PRIMARY INFORMATION SOURCES

U.S.G.S. 7.5 and 15 Minute Topographic Map Series.
U.S.G.S. Orthophotoquad Series.
Idaho Transportation Department, General Highway Map.
Latah County General Services Office.
Field checks.

MAP SHEET LOCATION DIAGRAM



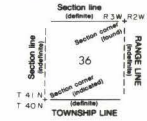
LEGEND

Compartment and Ranger District Boundary
Subcompartment Boundary
Stand and Substand Boundary
54-1 Compartment with Subcompartment Number
18 Stand Number
12-1 Stand with Substand Number
0.0 – 20.0% Risk
20.1 – 40.0% Risk
40.1 – 60.0% Risk
60.1 – 80.0% Risk
80.1 –100.0% Risk

THE GRID SYSTEMS

Geographic Co-ordinates 116° 45' 46° 52' 30"
State Plane Co-ordinates 240,000 FEET 1,890,000 FEET
Universal Transverse Mercator System 5,191,000 meters N

Public Land Survey



ELEVATIONS AND CONTROL POINTS

Spot elevation x 2943
Vertical control station:
Tablet, spirit level elevation BM x 2763
Other recoverable mark, spirit level elevation x 2057
Horizontal control station:
Tablet, vertical angle elevation VABM △ 3175
Any recoverable mark, vertical angle or checked elevation △ 2981
Horizontal and vertical control station:
Tablet, spirit level elevation BM △ 3841
Other recoverable mark, spirit level elevation △ 4896

TOPOGRAPHY

Elevations are heights above mean sea level.
Contour interval 80 FEET
Numbered contours 2000
Intermediate contours
Supplementary contours
Depression contours

HYDROGRAPHY

Rivers
Perennial streams
Intermittent streams
Water areas

MAP ORDERING INFORMATION

1) Use the **MAP SHEET LOCATION DIAGRAM** to identify the desired sheet.
2) Read the Index Numbers (to the left of, and below each sheet). For example, sheet 4,1 is VIOLA.
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1. Primary roads.
2. Secondary roads.
3. Cities and towns.
4. Railroads and airports.
5. Boundaries and elevations.
6. Rivers, streams, and physical features.
7. Grids.
8. Elevation contours.
9. Marginal information.

Further information is available from Cartographics, Department of Geography, College of Mines and Earth Resources, University of Idaho, Moscow, Idaho 83843 (Tel. 208-885-6216).

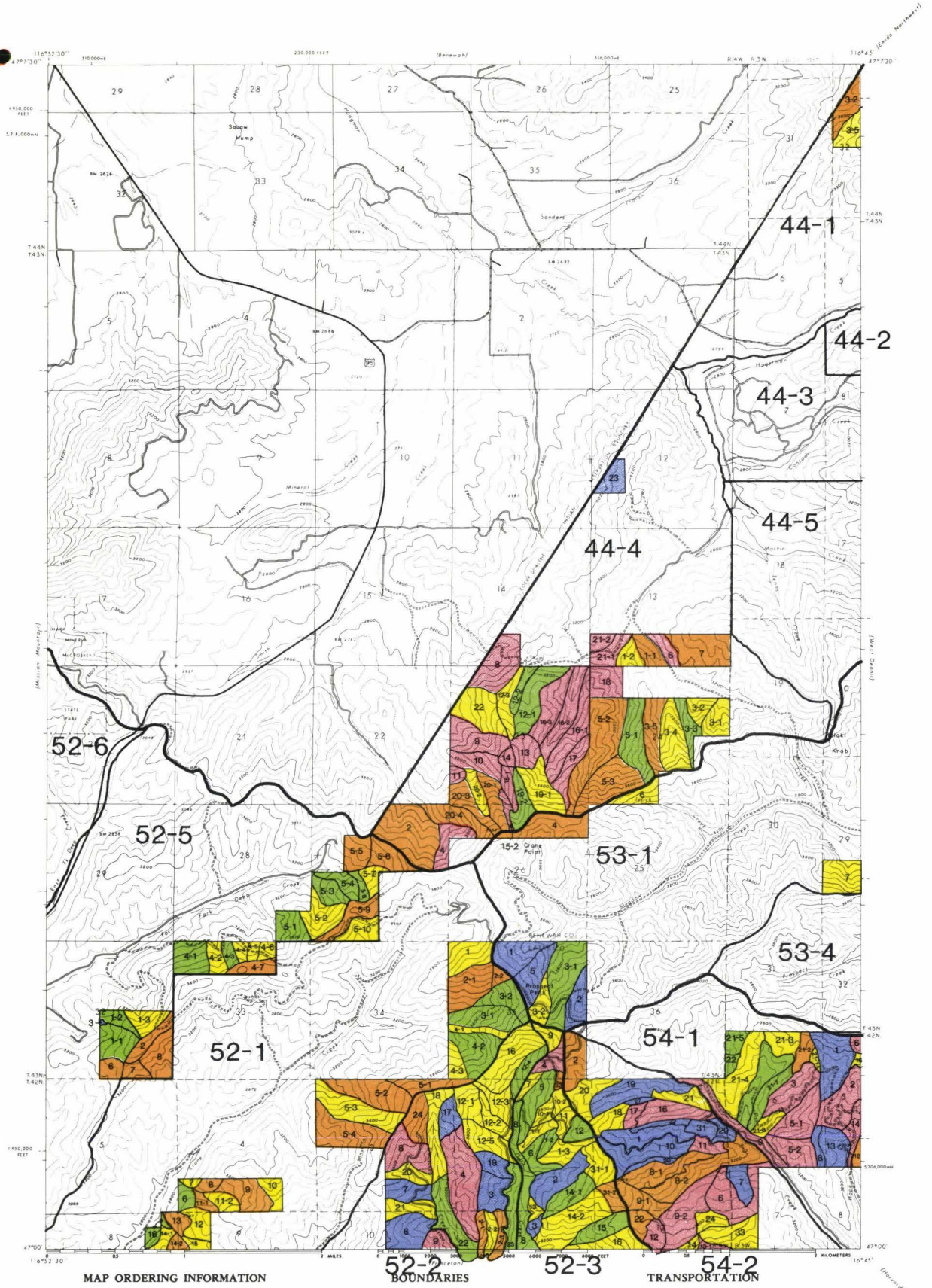
Index Number 2,4 Separation Numbers: 1,2, 5,6,7,8,9

BOUNDARIES

State boundary
County boundary
Public lands
Boundary monument
Incorporated town
Unincorporated town

TRANSPORTATION

Heavy-duty (paved)
Medium-duty (paved)
Light-duty (gravel)
Dirt
Unimproved
Primitive
U.S. Route
State Route
Private
Streets in town: main streets
side streets
Railroads
Airports



SANDERS

1979

1:24.000

This overlay made to fit over maps made by the Univ. of Idaho Cartographic Dept.

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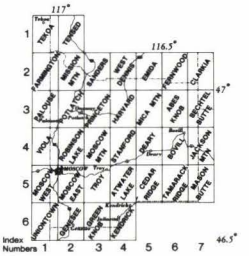
PRIMARY INFORMATION SOURCES

U.S.G.S. 7.5 and 15 Minute Topographic Map Series.
U.S.G.S. Orthophotoquad Series.
Idaho Transportation Department, General Highway Map.
Latah County General Services Office.
Field checks.

MAP SHEET LOCATION DIAGRAM



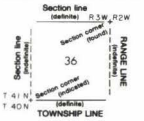
LEGEND

Compartment and Ranger District Boundary
Subcompartment Boundary
Stand and Substand Boundary
54-1 Compartment with Subcompartment Number
18 Stand Number
12-1 Stand with Substand Number
0.0 – 20.0% Risk
20.1 – 40.0% Risk
40.1 – 60.0% Risk
60.1 – 80.0% Risk
80.1 –100.0% Risk

THE GRID SYSTEMS

Geographic Co-ordinates 116° 45' 46° 52' 30"
State Plane Co-ordinates 240,000 FEET 1,890,000 FEET
Universal Transverse Mercator System 5,191,000 meters N

Public Land Survey



ELEVATIONS AND CONTROL POINTS

Spot elevation × 2949
Vertical control station:
Tablet, spirit level elevation BM × 2263
Other recoverable mark, spirit level elevation × 2057
Horizontal control station:
Tablet, vertical angle elevation VABM △ 3178
Any recoverable mark, vertical angle or checked elevation △ 2981
Horizontal and vertical control station:
Tablet, spirit level elevation BM △ 3841
Other recoverable mark, spirit level elevation △ 4896

TOPOGRAPHY

Elevations are heights above mean sea level.
Contour interval 80 FEET
Numbered contours
Intermediate contours
Supplementary contours
Depression contours

HYDROGRAPHY

Rivers
Perennial streams
Intermittent streams
Water areas

MAP ORDERING INFORMATION

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2. Secondary roads.
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4. Railroads and airports.
5. Boundaries and elevations.
6. Rivers, streams, and physical features.
7. Grids.
8. Elevation contours.
9. Marginal information.

Further information is available from Cartographics, Department of Geography, College of Mines and Earth Resources, University of Idaho, Moscow, Idaho 83843 (Tel. 208-885-6218).

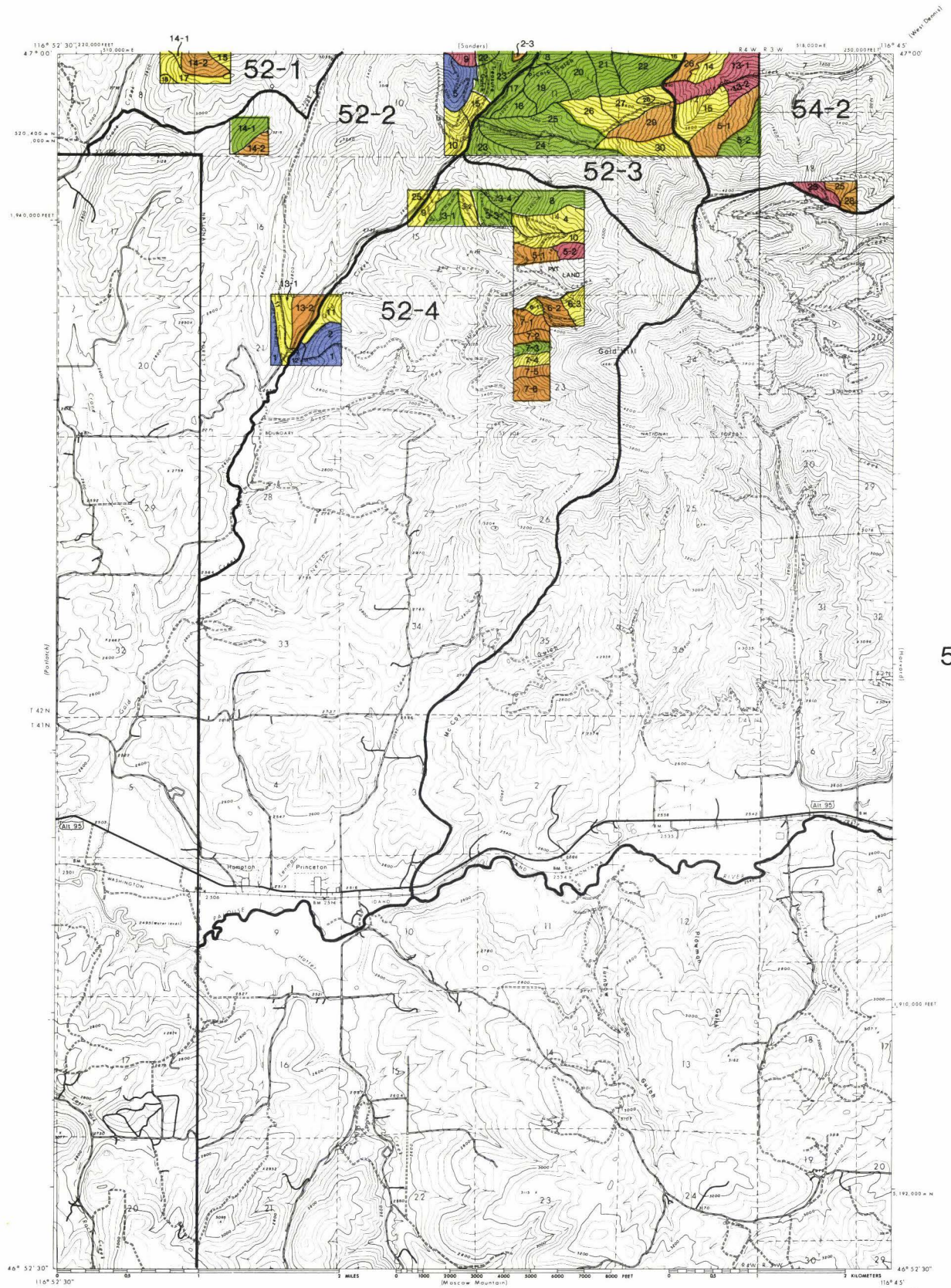
Index Number 2,3 Separation Numbers: 1,2,3, 5,6,7,8,9

BOUNDARIES

State boundary
County boundary
Public lands
Boundary monument
Incorporated town
Unincorporated town

TRANSPORTATION

Heavy-duty (paved)
Medium-duty (paved)
Light-duty (gravel)
Dirt
Unimproved
Primitive
U.S. Route
State Route
Private
Streets in town: main streets
side streets
Railroads
Airports



PRINCETON

1978

1:24.000

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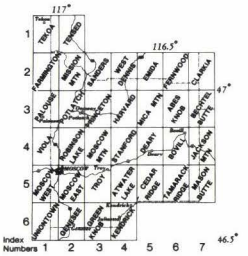
PRIMARY INFORMATION SOURCES

U.S.G.S. 7.5 and 15 Minute Topographic Map Series.
U.S.G.S. Orthophotoquad Series.
Idaho Transportation Department, General Highway Map.
Latah County General Services Office.
Field checks.

MAP SHEET LOCATION DIAGRAM



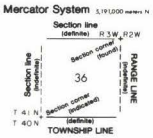
LEGEND

- Compartment and Ranger District Boundary
- Subcompartment Boundary
- Stand and Substand Boundary
- 54-1 Compartment with Subcompartment Number
- 18 Stand Number
- 12-1 Stand with Substand Number
- 0.0 – 20.0% Risk
- 20.1 – 40.0% Risk
- 40.1 – 60.0% Risk
- 60.1 – 80.0% Risk
- 80.1 –100.0% Risk

THE GRID SYSTEMS

Geographic Co-ordinates 116° 45' 46° 52' 30"
State Plane Co-ordinates 240,000 FEET 1,890,000 FEET
Universal Transverse Mercator System 5,191,000 meters N

Public Land Survey



ELEVATIONS AND CONTROL POINTS

Spot elevation
Vertical control station:
Tablet, spirit level elevation
Other recoverable mark, spirit level elevation
Horizontal control station:
Tablet, vertical angle elevation
Any recoverable mark, vertical angle or checked elevation
Horizontal and vertical control station:
Tablet, spirit level elevation
Other recoverable mark, spirit level elevation

TOPOGRAPHY

Elevations are heights above mean sea level.

Contour interval 40 FEET
Numbered contours
Intermediate contours
Supplementary contours
Depression contours

HYDROGRAPHY

Rivers
Perennial streams
Intermittent streams
Water areas

MAP ORDERING INFORMATION

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Index Number 3,3 Separation Numbers: 1,2,3,4,5,6,7,8,9

BOUNDARIES

- State boundary
- County boundary
- Public lands
- Boundary monument
- Incorporated town
- Unincorporated town

TRANSPORTATION

- Heavy-duty (paved)
- Medium-duty (paved)
- Light-duty (gravel)
- Dirt
- Unimproved
- Primitive
- U.S. Route
- State Route
- Private
- Streets in town: main streets
- side streets
- Railroads
- Airports

MISSION MOUNTAIN

1979

1:24,000

This overlay made to fit over maps made by the Univ. of Idaho Cartographic Dept.

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PRIMARY INFORMATION SOURCES

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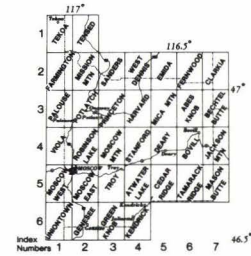
U.S.G.S. Orthophotoquad Series.

Idaho Transportation Department, General Highway Map.

Latah County General Services Office.

Field checks.

MAP SHEET LOCATION DIAGRAM



LEGEND

- Compartment and Ranger District Boundary
- Subcompartment Boundary
- Stand and Substand Boundary
- 54-1 Compartment with Subcompartment Number
- 18 Stand Number
- 12-1 Stand with Substand Number
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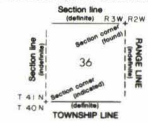
THE GRID SYSTEMS

Geographic Co-ordinates 116° 45' 46° 52' 30"

State Plane Co-ordinates 240,000 FEET 1,890,000 FEET

Universal Transverse Mercator System 5,191,000 meters N

Public Land Survey



ELEVATIONS AND CONTROL POINTS

Spot elevation

Vertical control station:

Tablet, spirit level elevation

Other recoverable mark, spirit level elevation

Horizontal control station:

Tablet, vertical angle elevation

Any recoverable mark, vertical angle or checked elevation

Horizontal and vertical control station:

Tablet, spirit level elevation

Other recoverable mark, spirit level elevation

TOPOGRAPHY

Elevations are heights above mean sea level.

Contour interval 80 FEET

Numbered contours

Intermediate contours

Supplementary contours

Depression contours

HYDROGRAPHY

Rivers

Perennial streams

Intermittent streams

Water areas

MAP ORDERING INFORMATION

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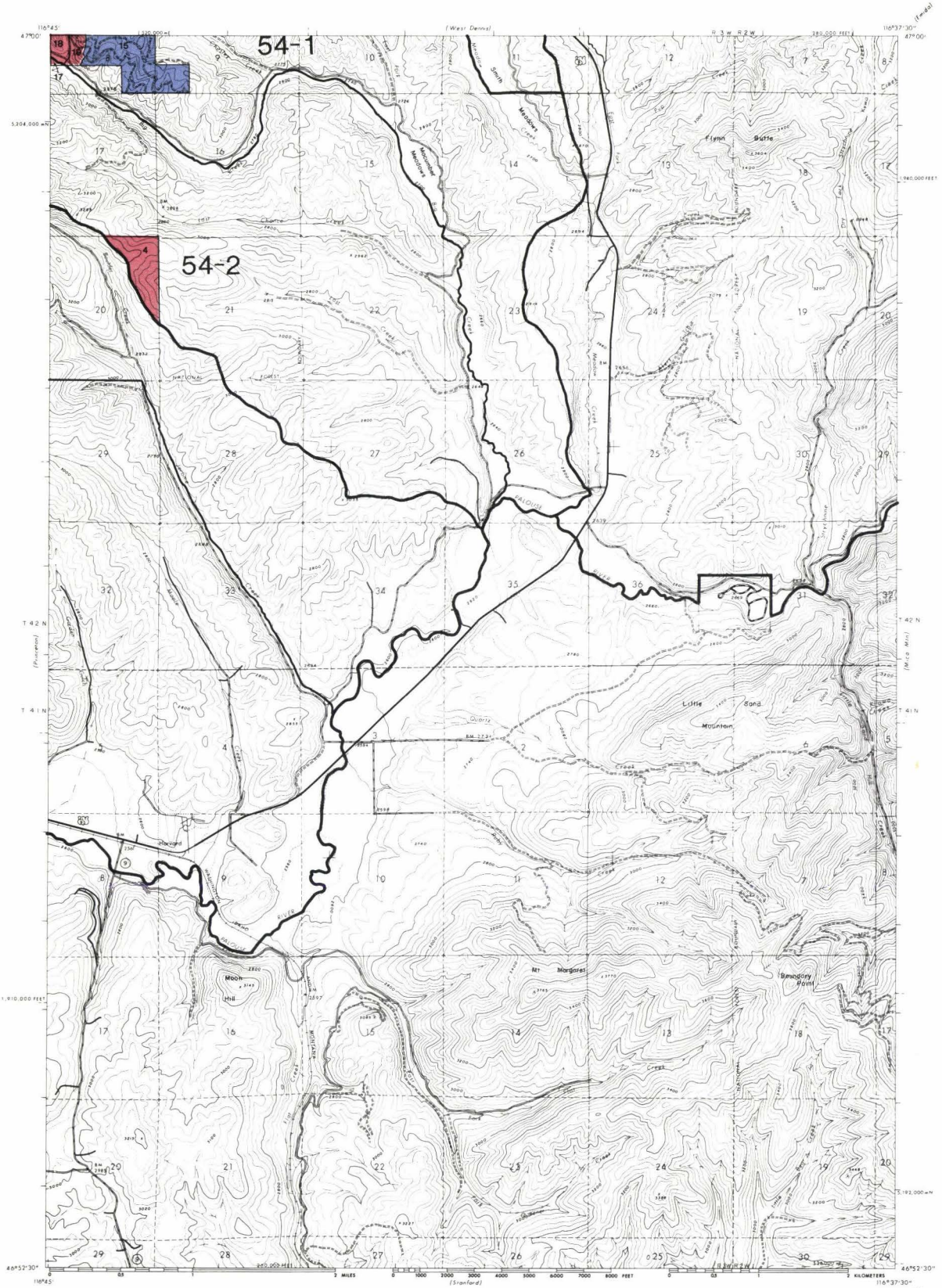
Index Number 2,2 Separation Numbers: 1,2,3, 5,6,7,8,9

BOUNDARIES

- State boundary
- County boundary
- Public lands
- Boundary monument
- Incorporated town
- Unincorporated town

TRANSPORTATION

- Heavy-duty (paved)
- Medium-duty (paved)
- Light-duty (gravel)
- Dirt
- Unimproved
- Primitive
- U.S. Route
- State Route
- Private
- Streets in town: main streets
- side streets
- Railroads
- Airports


54-1
54-2
R 3 W R 2 W
T 42 N
T 41 N
Little Sand Mountain
Mt Margaret
Browndirt Point
Moon Hill
Harvard
Viola
Genesee
Moscow
Troy
Kendrick
Juliaetta
Potlatch
Deary
Bovill
Elk River
Avery
St Maries
Clarkia
Fernwood
Tensed
Tekoa
Plummer
Worley
Tensed
Benewah
Santa
Tamarack
Setters
Emida
Dover
Careywood
Athol
Rathdrum
Spirit Lake
Hayden Lake
Hayden
Coeur d'Alene
Post Falls
Rathdrum
Spokane
Mica Peak
Liberty Lake
Greenacres
Otis Orchards
Veradale
Newman Lake
Mead
Colbert
Deer Park
Chattaroy
Loon Lake
Addy
Northport
Metaline Falls
Ione
Usk
Cusick
Newport
Oldtown
Priest River
Sandpoint
Kootenai
Hope
Clark Fork
Dover
Sagle
Bonners Ferry
Naples
Porthill
Moyie Springs
Copeland
Elmira
Boundary
Bonners Ferry
Leonia
Eastport
Creston
Yaak
Troy
Libby
Rexford
Trout Creek
Heron
Noxon
Trout Creek
Thompson Falls
Paradise
Plains
Alberton
Superior
St Regis
Haugan
Lookout Pass
Wallace
Mullan
Silverton
Kellogg
Pinehurst
Smelterville
Wardner
Osburn